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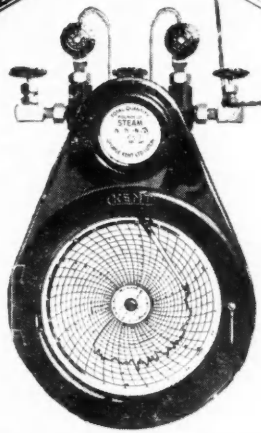

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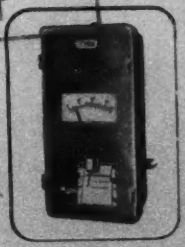

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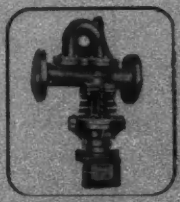

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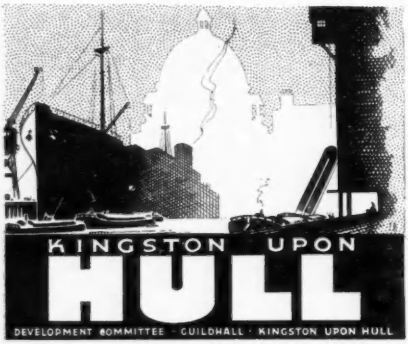

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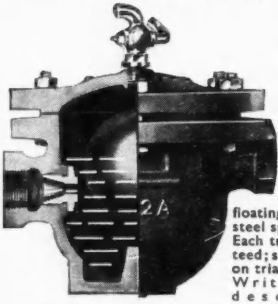

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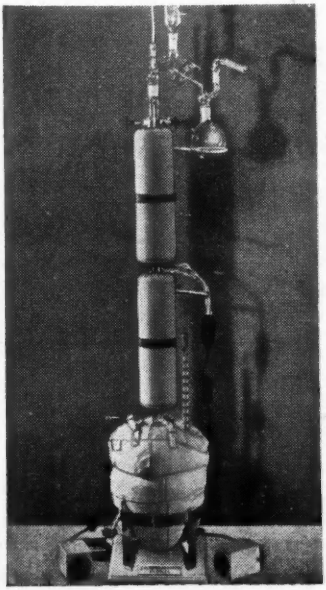

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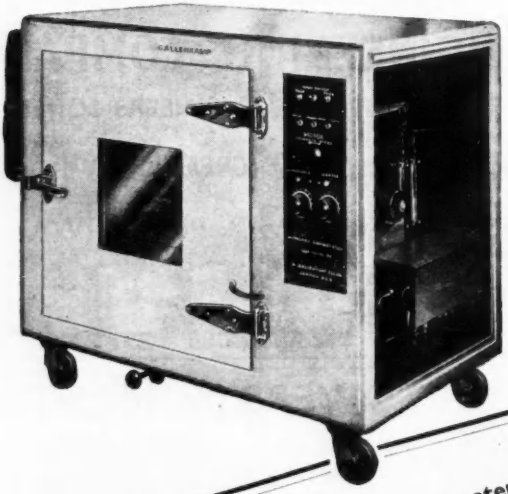

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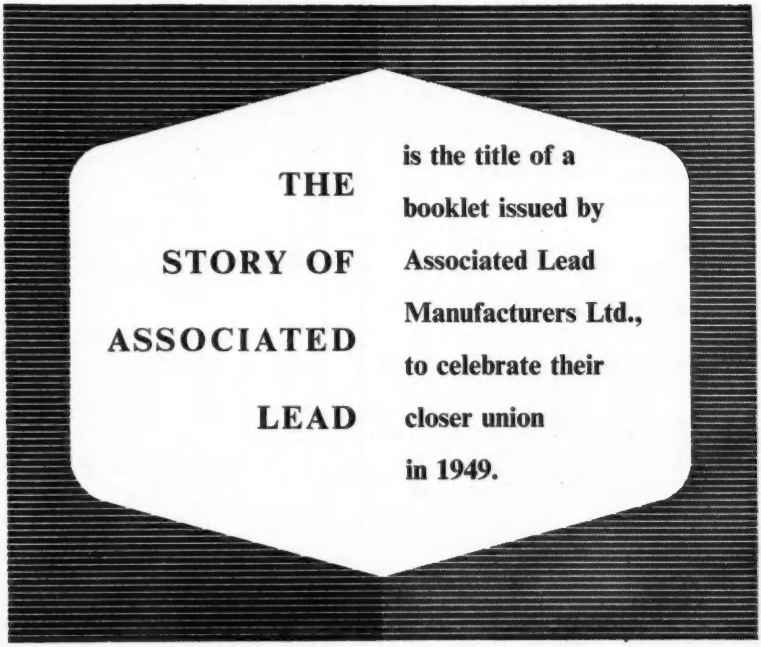

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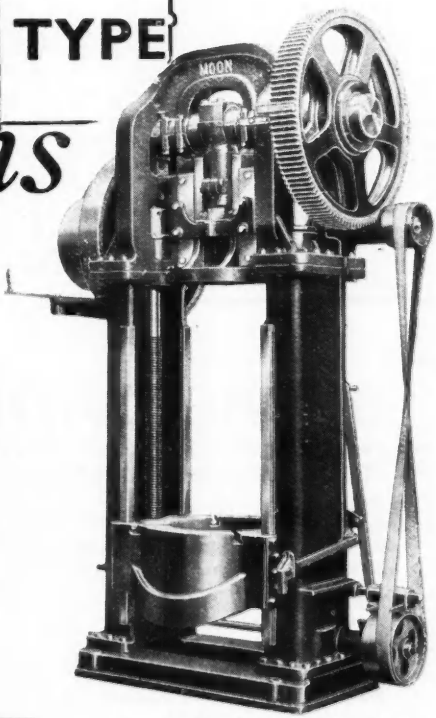

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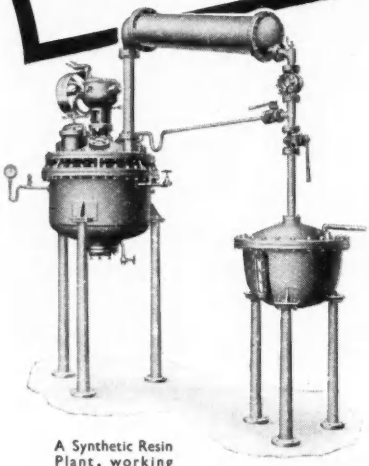

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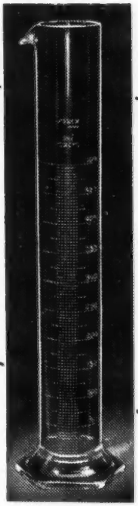

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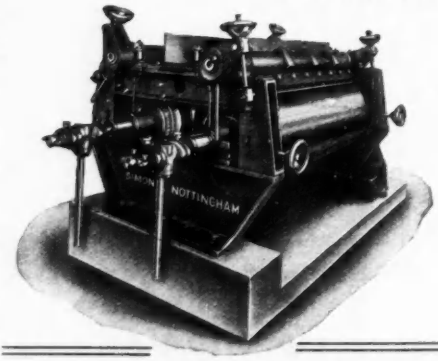

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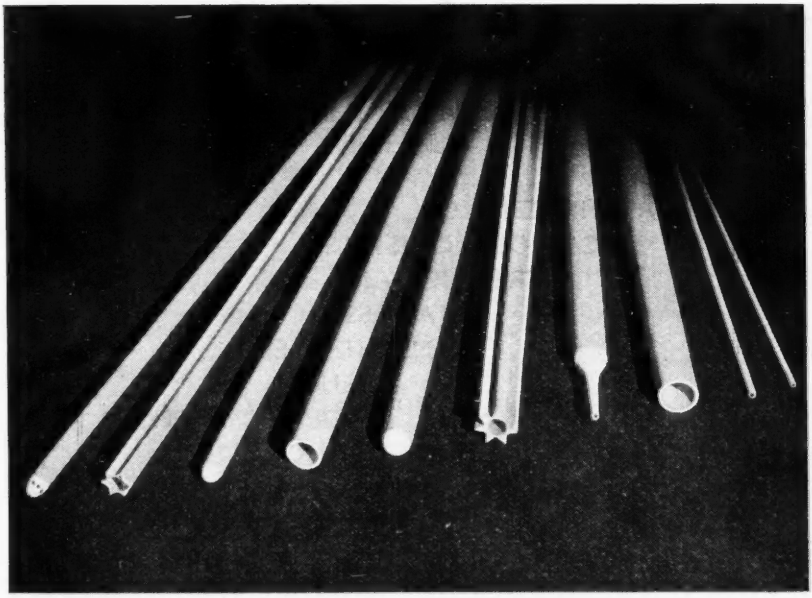

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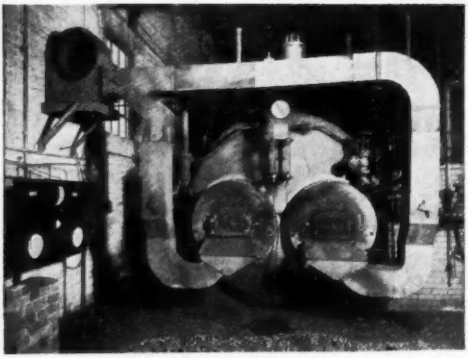

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Registration of Chemists

WHAT is there in common between the Ministry of Labour and the profession of chemistry? At the moment very little, notwithstanding the increasingly large proportion of scientific appointments for which the Ministry (or one of its gargantuan fellows) is the patron; and chemists as a whole are content that the affiliations should remain as they are. If there were any doubt about that the comparatively meagre support that was given in London last week to an expert discussion of the subject by Professor W. Wardlaw to the London and South-Eastern members of the Royal Institute of Chemistry did little to strengthen it. The lecture hall of the Royal Society of Medicine seemed to dwarf that little gathering, called to discuss matters which in the light of current events may become of critical interest in the near future—the question of control of scientific manpower. The scientist—chemist, physicist and metallurgist in particular—has emerged from the decent obscurity in which in the past he produced new knowledge of historical importance, and seemed well content to remain. New forces, such as the spread of some measure of education throughout the kingdom, have broached the boundaries behind which in the past the curiosity of the layman seldom probed, and two wars of a new kind have completed the process of involving the chemist in the full light of public affairs and entangling him in the business of government.

Those are some of the relevant facts which culminated little more than a year ago in the creation of a national register of scientific manpower, or rather the nucleus of such a register, for there is no evidence at all that the majority of chemists have accepted the Government's invitation to sign on the dotted line and have their credentials and potentialities duly noted for the better ordering of the labour forces of this country. In view of the indifferent success attending the Government's other exercises in the direction of bricklayers and a host of artisans and labourers into fields where they are likely to be most useful, the scientists' want of confidence in it as a possible employment agency for them too was understandable. That is the view of the opposition, in reply to which Dr. Wardlaw and, of course, the Ministry of Labour have cogent arguments to offer.

Emphasising how marked a change has taken place in the status of the chemist, certainly in the public estimation, Dr. Wardlaw, discussing "the Ministry of Labour and the Profession of Chemistry," made no secret of the fact that whatever desirable results had come to pass were due very largely to the steady and unobtrusive work over a long period of years by the professional organisations, among which he singled out the RIC. So, says Dr. Wardlaw, the chemist and his profession have come to enjoy proper recognition both from the public and the

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administration. That is in striking contrast with the situation at the time of the first World War, in the early stages of which neither the Government nor the profession had any very clear idea where the chemist stood or what were his functions in the national scheme of things.

The closer association of the Ministry of Labour and the chemical profession really began in 1939 when an advisory council of 28 members was set up to advise on the best use in war of scientific and technical personnel. The late Professor J. C. Philip played an important part in helping to form this pool of experts and in drawing up an embracing definition of a chemist. As the war continued it was found that this pool was inadequate, and a technical personnel committee under the chairmanship of Lord Hankey was established to find the requirements of scientific manpower, not only for that emergency but for coming years. Other schemes to keep available a steady flow of technicians included the introduction of about 2000 State bursaries for chemists, engineers, etc., at the universities, which created a fresh source of the qualified men needed to augment scientific manpower where it was weak.

Since the end of hostilities the technical and scientific branch of the Ministry of Labour had realised the need to encourage particularly the ex-Service man, and this had been done by giving priority of admission to universities, and further educational and training grants, while in 1947 and 1948, so urgent was the need for chemists, that such students were allocated to civilian employment.

That was the recent history, recalled by Dr. Wardlaw, of the Government's current interest in all chemists. That his own contribution to the vital organisation of chemical manpower at the critical time was distinguished was cordially recognised in the course of discussion at the London meeting, when many were glad of an opportunity to acknowledge also that chemistry and countless individual chemists were in his debt. That respect and sense of obligation, it is evident, are not equally extended to the technical and scientific branch of the Ministry of Labour. The consensus of opinion of those who commented on the case presented by Dr. Wardlaw was that the technical and scientific branch had outlived its usefulness. The retention of a central register of scientific manpower was probably a necessary evil during the gradual transition from war to peace conditions, but that stage had now been passed, and with it had gone the one unassailable excuse for regimenting the laboratory workers.

Any such discussion is unlikely at any time to be free from political after-

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NOTES AND COMMENTS

£1583 M. from Exports

A DISPOSITION to regard from a defeatist standpoint United Kingdom prospects of achieving the great increase in export business required to discharge overseas indebtedness cannot indefinitely be maintained in the light of evidence provided month by month in the Customs and excise figures, of which those for December reflect a culminating point in a long series of advances. Because of the irregularity of the accounting periods, the £145.7 million realised by overseas sales last month is apparently £1.4 million less than was produced in November, which was, in any case, a record month. If, however, all months contained 26 working days, sales in December would have realised £151.5 million, compared with November's £147 million. On the same basis, the steady progress in overseas markets represented by the trend in the proportional rate from £115 million in January to £126 million in March, £139.5 million in June and £131 million in September (when some regression occurs in all years) is eloquent of this country's mounting capacity to meet the challenge of heightened competition from all quarters and hardening market resistance. The actual export total for the year of £1583.3 million still fails to close the balance of payments by £431.7 million (£596.5 million in 1947), but the capacity to do so within the present "breathing space" should not remain in doubt.

Chemicals' Quota

THE large contribution made by chemical industries to the heartening results, a total of £7.347 million in December and £83.67 in the 12 months, is proportionately higher than almost all others and, embracing as it does only the categories officially classified as "chemicals, drugs, dyes and colours," it necessarily tells only part of the story of widening enterprise. No account, for example, is taken in those records of achievement by the growing plastics industry, which earned £4.417 million last year, nearly £1.3 million more than a year before. These returns, which exclude casein and celluloid, show that in November and December sales of plastics yielded £391,346 and £344,790, contrasting arrestingly with the monthly average of some £21,000 before the war. Meanwhile, in virtually every main category of large-scale chemical production outstanding advances were recorded in December by comparison with the previous month. Almost the only substantial exceptions were calcium carbide, naphthalene, copper sulphate, caustic soda and the disinfectants and agricultural chemicals group.

Pooling Technology

ONE of the unforeseen results of America's increasing interest in invigorating European industries is a readiness to dispense with some of the safeguards with which it has been customary to hedge around the results of research in science and industry. An expansion of that principle, of which there have already been some support by individual companies, and by the U.S. chairman of the Anglo-American Productivity Council, Mr. P. D. Read, was clearly implied in the forecast of U.S. foreign policy conveyed in his inaugural address by President Truman. His suggestion that America should share some of her vast fund of technology with under-developed industries in other countries honestly striving to further the aims of European economic co-operation is, of course, little more than an expression of opinion, unless it is endorsed by Congress and particularly by U.S. industry. Curiously, the latter may be regarded as having originated the unconventional doctrine, not perhaps with competely disinterested motives, but with a liberality which cuts across accepted views in the past of the sacredness of specialised industrial processes. The principle that charity begins at home would seem to have been exemplified by the announcement by one of the largest U.S. chemical producers, E. I. Du Pont de Nemours, that its patents and technical resources for the production of cellophane were freely available to all in America who cared to profit by them. That example of liberality on the grand scale was stimulated by the political forces which have long been assailing America's cellophane "monopoly." Whatever motives have animated the stirrings of

this new policy, however, the example is capable of having salutary results in a wider sphere, even perhaps of modifying the exaggerated secrecy sometimes employed here to preserve " in purdah " processes and plant certainly not unique. That, in fact, is implicit in the American notion, which foresees reciprocal exchanges, the chief benefits of which will presumably be conferred on those with the greatest productive capacity.

Future of Streptomycin

SO rapid has been the sequence of events composing the story of streptomycin's origin, its clinical study and large-scale production and distribution that gaps in the general fund of information about what it will and will not do are necessarily wide, wider, in fact, than is commonly realised. There have been relatively many cases of almost spectacular response to streptomycin treatment, so that the temptation to over estimate the value of this form of therapy has not always been resisted. It is as well, therefore, that the whole subject of streptomycin's use has been given critical study by a special sub-committee of the World Health Organisation, whose first report, just published (*The Chronicle of the WHO, II*, 215), presents conclusions based on much clinical and laboratory experience and discourages indiscriminate use of the antibiotic or exaggerated reliance upon its powers. Everything combines to focus attention upon the powers of streptomycin to subdue some forms of tuberculosis, of which there has been some arresting evidence, and the medical experts of WHO have had to act as a restraining force to discourage irresponsible use which would have been accompanied by disastrous results. There is no doubt that if streptomycin had been made available for popular use its sales could have been enormous, and the damage caused by creation of streptomycin-resistant invading organisms and neglect of conventional and other treatments would have been on an equivalent scale. The amount of exploratory work remaining to be done is reflected by health organisation's statement that optimum regimens for different forms of tuberculosis have not been precisely determined and the medical practitioner must still make his own choice. One of the most useful services which WHO can perform may come from the work begun by its specialist tuberculosis committee, which has now been called upon to formulate a uniform record system for the analysis and evaluation of world-wide studies of streptomycin.

REGISTRATION OF CHEMISTS

(*Continued from page 180*)

thoughts, least of all in the present rather uneasy relations which exist between Government and industry. Accordingly, it was not surprising to hear strongly expressed at the London meeting of chemists the view that if the Ministry of Labour were to have a permanent and controlling interest in the employment of chemists the tool would be ready made for the hand of an unreservedly totalitarian Government to do what it would with scientists. In Moscow, the pattern is not hard to discern and the results are tragic. The final outcome of the central registry principle may be regimentation and the gradual extinction of the chemist's freedom to pursue his own professional objectives.

Summing up, in a brief reply to the critics, Dr. Wardlaw said: " No one is more of an individualist than I am. But under our system of administration any body of individuals whose voice is not heard at certain high levels, will end by having decisions made for them." Many professional organisations, said the professor, were looked upon from the administrative point of view as having an axe to grind, but it was his opinion that to have a trusted scientist, chemist, or technical expert as part of the high-level administration was essential. His voice would carry more weight than any other form of representation.

Such are some of the basic arguments being advanced by the advocates of " organised " science and their more numerous opponents, who are fully entitled to make effective use of the evident fact that any improvement in the prestige and fortunes of the chemist owes little to State intervention and almost everything to his own enterprise, co-ordinated by organisations of his own creation.

Exchanging Technology

Du Pont Releases Cellophane Patents

DECLARING that it is reluctant to expand its own facilities in view of U.S. Government charges that it monopolises the cellophane field, E. I. du Pont de Nemours and Co., Inc., has announced that it is prepared to license competitors to use its cellophane patents gratis to help meet the growing demand for cellophane. Moreover, Du Pont says it is ready to help prospective competitors to get started through the loan of key technical personnel and other assistance, including the leasing of sites now held by the company.

At present the Du Pont company accounts for about 75 per cent of the $65 million annual production of cellophane.

The company says: "The Du Pont company does not feel that it is in the interest of stockholders, in view of the Department of Justice attack on the company's position in the cellophane field, to risk the very substantial sum required for the needed increase in capacity. Manifestly, it is new capacity that is needed because a reallocation of existing facilities would accomplish nothing toward relieving the present shortage of cellophane."

Sharing U.S. Information

One of the most interesting features of the bold programme outlined by President Truman in his inaugural address in Washington on January 20 was the making available for the improvement of under-developed areas the benefits of American scientific and industrial advances.

This is something quite new in U.S. policy, and it remains to be seen how far it will receive the support and co-operation of Congress—writes our New York Correspondent.

There is almost certain to be some opposition from a good many quarters, particularly some sections of business.

However, if a plan can be produced that will ensure the steady economic development of the under-developed areas everywhere, and if other countries as invited by the President really pull their weight in sharing technological knowledge, and advancement, then this inaugural address and the new Administration may well prove to be a memorable one.

Dismantling in Germany.—Another 19 plants were completely dismantled in Germany during November, 1948, bringing the total to date up to 235. Work of dismantling is in progress at 195 plants, while 108 have still to be begun. A total of 279,000 tons has been despatched to recipient nations.

Heavy Chemical Prospects

U.S. Engineer Foresees a Boom

ECONOMICALLY the next most important "great new industry" will not be television or nuclear energy, but a group of industrial developments in the field of heavy chemicals, according to Mr. James M. Todd, New Orleans consulting engineer and president of the American Society of Mechanical Engineers. Mr. Todd believes that the emergence of a new industry comparable in growth to the automobile, radio or aviation industries, would be a godsend to a world "plunging forward into an uneasy peace."

The ASME president predicted that developments in the heavy chemicals field would include "a lot of chemicals, organic as well as inorganic, that we do not now think of as being heavy chemicals in the sense of being produced in carload lots."

"In a free-enterprise economy, what we call prosperity seems to be intimately associated with those surges of production of new capital goods that are commonly caused by the emergence and growth of some great new industry," he said.

"This is because the cost of producing the new capital goods, which is in the last analysis almost wholly wages, greatly increases the available purchasing power without providing an immediate corresponding increase in the supply of consumer goods," he declares. "Then demand goes up, prices firm, the consumer goods and service industries respond, employment increases, wages tend to increase, and the boom is on.

"If all this does not occur too rapidly, if unbridled optimism does not run rampant, as it did in 1929, if pure speculation as distinguished from constructive foresight does not get into the saddle, and particularly if the growth of the new industry is steadily maintained over a considerable period of time, the resulting prosperity is widespread, healthy and socially significant."

Design Centre for Rayon

The main purposes of the rayon industry design centre, lately opened in Upper Grosvenor Street, London, will be to study, in conjunction with the British Rayon Research Association, all possible methods for design, material and technique of rayon manufacture, to supply information to designers, and keep them in touch with the trend of overseas markets. This is the first industrial design centre to be incorporated under the Government scheme.

Scottish Oils and Chemicals

Press Views on Rapidly Expanding Programmes

FURTHER reflection of the increasing expansion in the production and use of chemicals in Scotland since the war is contained in a contemporary trade review of 1949 by the *Glasgow Herald*.

This attaches much importance to oil refining and associated chemical activities being developed at Grangemouth.

"On the heavy chemical side of the industry," the review notes, "the demand for mineral acids has been maintained at a high level. This is due in no small degree to requirements for fertiliser manufacture. Without the assistance of Government acid plants, Scotland would have been short of acid, but with their help it was possible to send surplus acid over the Border to relieve shortages in Northern England.

"There is every prospect that the fertiliser production will be maintained at around its present level for some years to come, since both of the major political parties are committed to policies of fostering agricultural production. The value of sulphuric acid as a weed killer has been appreciated by Scottish farmers, who have used larger quantities for this purpose in 1948 than in previous years.

"Government synthetic ammonia plants, including that at Mossend, near Glasgow, are being operated to help meet the demand for nitrogen fertilisers. The production of by-product sulphate of ammonia is also active. The output of sulphate by Scottish Oils, Ltd., is restricted rather by the supply of shale-mining labour than by the capacity of the sulphate plant.

"Some superphosphate makers are buying acid from distant sources to maintain the present high level of production. They fully recognise, however, that this is economically unsound, and are planning to make themselves independent of external supplies.

"During the war, triple superphosphate was imported from America in order to economise in shipping space. Plans have been announced for producing this concentrated fertiliser here. Further progress has been made in Scotland in the provision of granular compound fertilisers which simplify the distribution problem on the farm.

"Plans are in hand for a considerable expansion of salt production. At the beginning of the year supplies of salt were scarce, and some fishery salt was imported from Spain for the Scottish herring season. The position will improve progressively as new plants come into operation."

The review attaches importance to the development of new synthetic textile fibres —Terylene and Ardil—by I.C.I., Ltd. "In the plastics field a steady expansion has taken place, and new factories are under construction, including one at Dundee. It has been reported that the British Aluminium Company's plant at Foyers is being turned over to the manufacture of sodium and potassium chlorates, which are invaluable as weed killers, and there are various other similar developments in the pest control field."

New Gas Absorption Agent

Lye, which is now being manufactured by A. Boake, Roberts & Co., Ltd., has been introduced as an absorption agent for weak acidic gases and has been used successfully to replace the German pre-war supplies, which were known as Alkazid DIK and Alkazid M.

The company states the new product has been proved to be entirely satisfactory for the removal of hydrogen sulphide and carbon dioxide from hydrocarbon gases; after the lye has become saturated, the gases are removed by boiling and the lye is again ready for use in the absorbers. Only the minimum amount of heat is required to remove the gases and regenerate the lye. It has good corrosion characteristics and in most cases can be used in existing plant.

Ample Carbon Tetrachloride

Albright & Wilson, Ltd., announces that the output of carbon tetrachloride has recently been doubled by the operation of new units at their Widnes Works. Further units will be completed during 1949, giving a total capacity which is expected to exceed the requirements for home and export.

During the last twelve months many users have had difficulty in obtaining all the supplies they have required, and the company takes satisfaction in recording that this state of affairs need no longer exist.

World Agents.—Thos. W. Ward, Ltd., Albion Works, Sheffield, has taken over world sales distribution for Eldair Press Brakes and for the precision gauges manufactured by K. Emsley Ltd., Bradford.

DECEMBER EXPORTS YIELDED £7.3 m.

Total for 1948 was £83.6 m.

As 1948 ended, export figures for the chemical industry surpassed by a good margin the high level of the previous months. The total value of exports according to the latest issue of the *Trade and Navigation Accounts of the U.K.* (HMSO, 4s. 6d.) was £7,347,063 compared with £5,916,489 in December, 1947, and an increase of £373,262 over November, 1948.

The figure for the total export of chemicals (all groups) in 1948 was £83.6 million.

Bleaching powder, benzol, cresylic acid, tar oils and naphthalene, sodium carbonate and silicate showed marked increases, contrasted with December, 1947. The most conspicuous of the few declines were in respect of caustic soda and the insecticide, weed killer and disinfectant group.

CHEMICAL EXPORTS

	Dec. 1948	Dec. 1947
	Cwt.	Cwt.
Formic Acid	1,995	2,826
	Lb.	Lb.
Salicylic acid and salicylates ...	272,706	176,332
	Cwt.	Cwt.
Tartaric acid	1,414	1,132
Value of all other sorts of acid ...	£72,888	£50,102
	Tons	Tons
Aluminium oxide	110	20
Sulphate of alumina	3,087	1,703
All other sorts of aluminium compounds	313	349
Ammonium sulphate	15,577	16,381
Ammonium nitrate	9,045	9,855
All other sorts of ammonium compounds	1,186	1,308
	Cwt.	Cwt.
Bleaching powder	43,604	25,015
All other bleaching materials ...	9,501	9,169
Calcium carbide	3,288	1,704
	Gal.	Gal.
Benzol	25,408	544
Cresylic acid	253,317	167,583
Tar oil, creosote oil, arthracene oil, etc.	3,542,895	2,508,434
Value of all other sorts of tar oil	£45,247	£30,894
	Cwt.	Cwt.
Naphthalene	6,566	1,243
Collodin cotton	2,298	863
	Tons	Tons
Copper sulphate	1,079	657
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	38,057	56,619
	Tons	Tons
Fertilisers	4,567	4,079
	Cwt.	Cwt.
Glycerine	8,275	187
Nickel salts	6,834	3,851
Lead acetate, litharge, red lead, etc.	5,829	1,904
	Gal.	Gal.
Tetra-ethyl	140,482	72,618
	Tons	Tons
Magnesium compounds	947	790
	Gal.	Gal.
Methyl alcohol	9,849	13,803
	Cwt.	Cwt.
Potassium compounds	5,829	11,351
	Tons	Tons
Salt	21,826	10,384
	Cwt.	Cwt.
Sodium carbonate, etc.	420,472	218,419
Caustic soda	56,826	219,793
Synthetic soldium nitrate ...	20	—
Sodium silicate	34,866	9,987
Sodium sulphate	14,721	19,038
All other sodium compounds ...	79,306	58,373
Cream of tartar	206	67
Tin oxide	641	609
	Tons	Tons
Zinc oxide	1,771	1,101
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,943,092	£3,196,080
Quinine and quinine salts ...	Dec. 1948 Oz. 157,094	Dec. 1947 Oz. 88,523
Acetyl-salicylic acid	Lb. 160,482	Lb. 112,173
Insulin	100 International Units 1,659,816	100 International Units 331,351
Penicillin	Mega units 442,986	Mega units 148,817
Total value of drugs, medicines and preparations	£1,425,229	£1,220,881
	Cwt.	Cwt.
Plastic materials other than casein and celluloid, etc.	28,690	23,097
Value	£344,790	£263,419
	Cwt.	Cwt.
Chemical glassware	1,299	1,128
Value	£47,347	£47,343
	Tons	Tons
Coal	1,117,869	157,663
Value	£4,155,823	£488,932
	Tons	Tons
Fans	235	191
Value	£144 871	£94.075
	Tons	Tons
Furnace plant	512	604
Value	£80,870	£120,229
	Tons	Tons
Gas and chemical machinery ...	1,282	795
Value	£319,412	£132.545

CHEMICAL IMPORTS

	Dec. 1948	Dec. 1947
	Cwt.	Cwt.
Acetic acid	4,353	13,315
Boric acid	400	7,003
Tartaric acid	—	—
All other acids	4,290	1,978
Borax	2,400	28,400
Bromine and bromides	197	776
Calcium carbide	31,259	12,665
Coal tar products, excluding benzol and cresylic acid ...	6	5,837
Cobalt oxides	304	264
	Tons	Tons
Ammonium phosphate	—	—
Arsenic	1,200	1,188
Fertilisers	16,271	16,139
	Lb.	Lb.
Iodine	—	59,569
	Cwt.	Cwt.
Potassium chloride	556,966	525,058
Potassium sulphate	24,476	25,762
All other potassium compounds	1,862	5,334
Sodium nitrate	—	—
All other sodium compounds ...	5,519	1,561
Carbon black	28,736	34,879
Total value of chemicals, drugs, dyes, and others	£2,043,653	£2,203,349

Detecting Electrical Faults

Scientific Principles at the GPO

THE expanding use by the GPO of highly evolved detecting and measuring instruments is one of the chief factors permitting the maintenance and development of the elaborate telecommunication system now operating.

This is made evident in a current summary which the GPO has issued dealing with this aspect of its work in maintaining communications over 23½ million miles of wire underground and two million miles overhead.

Breakdowns

Underground cables have an outer sheathing of lead and the largest types may contain as many as 3000 separate wires, which for technical reasons, are insulated with paper. The entry of water in a telephone cable causes a rapid breakdown since the paper insulation quickly absorbs water and is rendered useless.

The location of a breakdown due to water penetrating a cable is determined by means of testing apparatus with which every main exchange is equipped. The latest type of fault locator, the pulse locator, has been developed by Post Office engineers. It comprises a cathode ray tube detector, and it transmits a high frequency pulse over the cable which is reflected from any impedance due to a fault. The time taken by the pulse to travel to and from the fault is measured on a special recorder and from this it is possible to calculate the distance to the fault with remarkable accuracy. The work of restoring telephone service interrupted by floods cannot be started until the floods have subsided and the water has been pumped out of the cable ducts. Damp is removed from the inside of cables by blow lamp or by pumping through the cable air which has been dried by being passed through calcium chloride, or by pumping carbon dioxide through the cable.

Largest Conveyor Belt

The largest coil of rubber-faced conveyor belting yet produced at the Dunlop factory in Cambridge Street, Manchester, has been delivered to the Gas Light & Coke Company's works at Beckton. It is 2000 ft. long, 30 in. wide and weighs 6¼ tons. The rubber cover of 3/16 in. on the face is specially designed to convey hot coke. It will be used almost entirely for renewals on coke conveyors associated with the horizontal retort houses at Beckton, and some probably on the plant for conveying coal

Measurement and Control

New Association Records Rising Demand

PRESIDING at the annual general meeting in London last week of the British Industrial Measuring & Control Apparatus Manufacturers' Association, Mr. W. G. Ardley said that 1948 had been a busy year for the association and for its members individually.

Although a comparatively young association, the BIMCAM had made remarkable progress, and was now established and recognised as representing the industrial instrument industry. The industry had an increasingly important part to play in furthering increased industrial productive efficiency.

The demand for industrial measuring and control instruments was increasing, but so was the production of those instruments. The drive for increasing efficiency brought in its train the urge for standardisation, but standardisation was only of use if it actually helped to increase production generally and assisted in meeting export needs.

First President

Relinquishing the office of chairman, which he has held since the formation of the association, Mr. Ardley was unanimously elected to be the first president. Mr. H. W. Blake was elected chairman, and Mr. L. S. Yoxall deputy chairman. The following were elected members of the committee for 1949:—Messrs. H. W. Arkell, G. H. Barker, G. A. Edwards, L. Pyweli, W. G. Thomas.

The annual meeting followed a luncheon at which many prominent personalities in chemical, fuel and water industries and civil engineering were among the guests.

Sand as Lead Substitute

AFTER 14 years of laboratory work and testing, officials of the National Lead Company in the U.S.A. have recently claimed to have found a practicable method of substituting lead-coated sand particles for lead in the manufacture of outdoor paint. Lead consumption in the U.S.A. last year exceded more than 1 million tons, of which only about two thirds were indigenous.

The new method, it is said, may reduce lead requirements for outdoor paint by about two-thirds. It is hoped that factories for the new material will be in operation in the course of the current year. It is pointed out that the good effect of lead in paint was the surface of the metal, which will still be available.

MORE GERMAN CHEMICALS?

U.S. Research Chemist Attacks Controls

FURTHER support for the view widely held in America that a greater measure of chemical production should be permitted in the Western zones of Germany has been offered by Dr. Emil Ott, director of research of the Hercules Powder Company. Addressing the Synthetic Organic Chemical Manufacturers' Association, Dr. Ott said that recovery of Western Germany was seriously hampered by laws and regulations that block the rehabilitation of its chemical industry. He recently visited a number of Germany's leading chemical plants, and had come to the conclusion that chemicals were practically the life blood of Germany, and that if Germany was to be put back on its feet, economically, special attention would have to be given to the industry's needs.

Citing the lack of adequate patent protection and rules requiring registration of all chemical research as two factors contributing to stagnation of new developments in the industry, Dr. Ott indicated that the future rôle of the chemical industry in Germany may be one of producing specialised products and developing special processes for licence abroad.

However, processes of German development, such as the Fischer-Tropsch synthesis and acetylene chemistry had important aspects for future development, said Dr. Ott, and extensive research in the production of industrial chemicals under high pressure was now being carried on in at least one German laboratory.

Discoveries Concealed?

He regretted that no progress had been made in rehabilitating the German patent system and that present facilities for depositing of data on new inventions, so as to fix the dates of discoveries, are held in suspicion as German chemists do not know what use is made of reports submitted. Until such rehabilitation, German chemists will be reluctant to disclose their discoveries. For the present, the new developments are being retained in the heads of the scientists who, without patent protection, are unwilling to put research results in a written form which might get into competitors' hands.

Dr. Ott confirmed that chemical production in the Western zones is now approximately 50 per cent of the pre-war volume. Total production in the Anglo-American zones is said to be 75 per cent of 1936 level (THE CHEMICAL AGE, *60*, 150).) German industrialists, he said, anticipated the full pre-war level would be attained within three years.

Chemical production was, of course, still limited to those items which cannot be used for war. For example, synthetic rubber made in the United States or natural rubber can be purchased to be fabricated into peacetime products, but Germany cannot itself produce synthetic rubber. Dismantling of German chemical and other plants remained a stumbling block to economic recovery.

It might be better, Dr. Ott suggested, to let the German chemical industry utilise its pre-war plants to the best advantage rather than require their destruction. Many of these plants were obsolete. Their retention might circumvent future competition from ultra-modern plants which might later be built if present plants were scrapped.

Dismantled Plant Not Wanted

Another speaker at the meeting was Mr. C. C. Concannon, chief of the chemicals and health branch, commodities division of the Office of International Trade, who told the chemical manufacturers that a list of some 800 plants made available under reparations plans had been submitted to him, and that he had failed to find anyone who wants them. He considered some of the dismantled plants would be little more than junk piles once dismantled.

Reports on German War Industries

A further seven BIOS and FIAT reports, published on January 22, are announced by the Board of Trade as being available:

BIOS 1642. Chemische Dungerfabrik Rendsburg. Manufacture of sulphuric acid. (HMSO, 1s. 6d.)

BIOS 1806. Pressure dyeing. (6s.)

BIOS 1814. German metal degreasing practice. (3s. 6d.)

BIOS 1818. Accelerated light fading equipment in I.G. (1s. 6d.)

BIOS 1826. German power press industry. (6s.)

FIAT 1120. Large scale production of oxygen. (12s.)

FIAT 1128. Rubber reinforcing carbon blacks from naphthalene and anthracene (CK3 and CK4 blacks). (4s. 6d.)

It is recalled that German patent specifications, accepted by the Berlin Patent Office during the war, can be seen at the Patent Office Library, 25 Southampton Buildings, Chancery Lane, W.C.2. Photographic copies cost 6d. per page.

Plastics Uses in the Textile Field

Increasing Adaptation of Synthetic Fibres

THE development of purely synthetic fibres, as yet in its infancy, holds promise of a very big future, Mr. E. B. Higgins, A.M.C.T. (Dyestuffs Division, I.C.I., Ltd., Manchester), told members of the Oldham Branch of the Textile Institute at a meeting held in Oldham recently.

Mr. Higgins, speaking on "Plastics for Textiles," said that the plastics industry, although comparatively new, had already exerted a considerable influence over practically the whole field of industry. The types of synthetic resins most important to the textile industry were the thermosetting and the thermoplastic materials.

The speaker explained how synthetic resins and man-made fibres were compounded, and briefly discussed the history of these. Pre-eminent among the purely synthetic fibres, he said, were the nylons developed by du Pont from the original researches of Carothers. Other long-chain fibres were developed from the vinyl resins.

Dealing with the processing of rayon yarns, Mr. Higgins explained the difficulty of sizing nylon. As the surface of the yarn was smooth, considerable difficulty was experienced in obtaining good adhesion of sizes based on starch and gelatine.

The most satisfactory sizes had been obtained with polyvinyl alcohol, which had also been used successfully with viscose rayon. In the manufacture of polyvinyl alcohol, the viscosity of the polymer was controlled, producing low viscosity grades for use with nylon yarns, and high viscosity grades for viscose.

Thermosetting resins were used as finishing agents on cellulosic fabrics because they gave durable crease resistant finishes.

The use of thermoplastic resins as finishing agents was explained, and Mr. Higgins said they could be used for "bonding" fabrics together. An example of the technique of this was seen in the production of a bonded semi-stiff collar. The interliner, usually an open plain weave cotton cloth, was loaded with resin, dried, shaped, and sewn between two layers of shirting. The three plies were then bonded together by heat and pressure.

Other bonding and finishing processes were described, and Mr. Higgins closed his talk with a reference to the growing demand for durable finishing agents. Although finishing agents based on plastics did not provide the perfect answer to the finisher's prayer, he believed that they offered the most promise towards that end.

FRENCH PLASTICS

JANUARY 24-27 will be the International Plastics Days to be held at the Maison de la Chimie, Paris, giving technicians and industrialists the opportunity of studying present problems of research, manufacture, and application of plastics. M. Dubois, director of the Plastics Study Centre, states that, while the industry is of small importance as regards tonnage, within the framework of the French chemical industry, it is nevertheless fundamental. Results obtained in aviation and ocean transport were largely due to the use of polythene in radar, silicones for motors and vinyl products for wrapping war weapons.

French annual production, amounting to 23,000 tons, says M. Dubois, could be doubled, provided maximum use could be made of existing equipment. French plastics production, however, during the last seven years had only doubled, compared with 100 per cent increase every three years in the U.S.A. The industry needed credits at least 10 times larger than those now allotted, and supplementary power and mechanisation to make up for shortage of manpower.

PAPER FROM STRAW

INFORMATION newly released relating to the development in the U.S.A. of paper making from straw indicates that the Kinsley Chemical Co., Cleveland, Ohio, claims to have succeeded in producing a long fibre that gives strength, durability and good appearance to straw paper.

The process has recently been demonstrated on a commercial scale at the works of the Chemical Paper Manufacturing Co., Holyoke, Mass., with a run of several tons of newsprint. The company's president declared that by the new process newsprint can be made at a cost of $65 per ton, as compared with the current price of about $100 per ton for woodpulp newsprint. Straw cigarette paper would sell for $120 to $130 a ton against $480.

The company plans the addition of a new unit, at a cost of $500,000, to the existing plant, to manufacture the chemical required in the new process. It is already negotiating licensing arrangements with interests in both Spain and South Africa.

The length of fibre is stated to be the secret of the paper's high tensile strength and high resistance to puncture.

THE "ATOMIC" CLOCK

New Application of Micro-Wave Absorption

AMERICA'S atomic clock, recently described by the U.S. National Bureau of Standards, by which it was developed, has come to be recognised, not as a laboratory curiosity but as an important new application of a fundamental principle intimately concerning chemists and physicists.

Based on the natural frequency of the vibration of atoms of the ammonia molecule, the clock represents an entirely new primary standard of true measurement which preserves constant accuracy, unimpaired by age and many other factors introducing variants, and which surpasses by several orders of magnitude the accuracy of the present primary standard, the earth's rotation.

It is controlled by a constant frequency derived from a microwave absorption line of ammonia gas, providing a time constancy of one part in 10 million. Theoretical considerations indicate a potential accuracy of one part in a billion or possibly 10 billion, depending on the type of atomic system and spectrum line used.

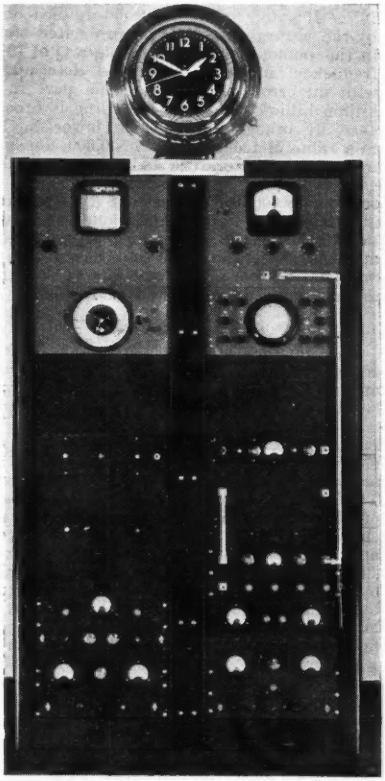
Precise Measurements

The improvements in frequency and time measurement offered are thought capable of affording significant aid in every technical field where precise measurements of time and frequency are crucial.

The clock consists essentially of a crystal oscillator, a frequency multiplier, a frequency discriminator, and a frequency divider, all housed in two vertical cabinet racks, on the top of which are mounted a special 50-cycle clock and a waveguide absorption cell.

Ammonia gas under a pressure of 10 or 15 microns is maintained in this cell, a rectangular ½ by ¼ in. copper tube wound in a compact 30-ft. spiral about the clock. The basic principle is the use of the absorption frequency of ammonia to hold constant a microwave signal.

If the signal output of a generator differs in frequency from the ammonia absorption line, the control circuits generate an "error signal" which brings back the microwave signal to the frequency of the spectrum line. The oscillator generating the microwave signal is thus controlled, and the setting of the clock which it drives, is regulated by the same effect. The microwave signal is initiated by a 100-kilocycle quartz-crystal oscillator or any other oscillator which is designed for a high degree of stability.



The ultimate accuracy of an atom clock depends on many factors, of which the most important are those governing the width of the spectrum line. Spectrum lines have a finite width covering a considerable frequency range, since atoms or molecules do not emit or absorb radiation at only one frequency but rather over a narrow band of frequencies. The ratio of a line frequency to its width at the half-power points is called the Q of the line, in analogy to the Q (quality) factor of resonant circuits used in standard radio technique. The Q is a measure of the sharpness of the line and therefore determines its usefulness as an accurate frequency and time standard.

In ammonia, the natural line width, determined by the uncertainty principle of quantum mechanics, gives a Q of about

10^{18}. If a line width were determined only by the natural time line of an excited state in the ammonia molecule, giving a Q of 10^{18}, frequency and time could be determined with an error of less than one part in a billion billion. However, the line is broadened by other factors which lower the Q to a value of from 50,000 to 500,000, depending on the temperature and pressure of the gas. This may be compared to Q values of roughly 50,000 for a good cavity resonator in a microwave circuit and values of 1 million or so for the best quartz crystals. The ammonia spectrum line thus has a Q approximating that of the best quartz crystals, though much more constant and stable.

Gas Molecules

The ammonia molecules in the absorption cell move rapidly in random thermal motion at an average speed of some 2000 ft. per second at room temperature. When a gas molecule in the absorption cell is approaching or receding from the source of an electromagnetic wave, because of its heat motion, its absorption frequency varies. This gives rise to a "Doppler broadening" of the absorption line, analogous to the change in pitch of sound as its source approaches, passes, and leaves an observer. Thus, the line width can be reduced slightly by lowering the temperature of the gas (or by using a heavier molecule). Doppler broadening lowers the Q of the ammonia line to about 350,000 at room temperature.

Improvement of the accuracy of the atomic clock will make it useful in several fields of pure and applied science. The programme at the Bureau of Standards is being carried on along several different lines. Among these is a project being developed with the co-operation of the atomic beam laboratory of Columbia University (New York City) which may result in greatly improved accuracy. In this method, quantum transitions in beams of atoms, such as cesium, will be used to establish frequency and time standards. In this method, broadening of lines is largely eliminated so that the potential accuracy is increased by a factor of 10 to 100 or more.

The wider implications of what has been done in America are associated with the chemical analysis of many heavy molecules by means of a microwave spectroscope. This makes it highly desirable to place frequency standards on an atomic basis for the more precise measurement of molecular constants.

Spectroscopic analysis has hitherto been dependent on infra-red, optical, and ultra-violet methods, which are generally limited to work on atoms and the simpler molecules. Medical and industrial chemistry, however, requires analysis of large, complicated molecules. The heavy molecules, rotating at slower rates, usually have spectrum lines in the microwave region so that the recent advances in microwave measurement promise highly accurate methods for the study of molecular constitution. Such large molecules are principally involved in the fields of high polymers, plastics, rubber, textiles, oil, foods, drugs, and biological chemicals such as vitamins.

Isotope identification (of radioisotopes) is not possible by ordinary chemical methods, which deal only with the outer parts of an atom or molecule and not with the nucleus. The microwave spectrometer, having a resolution up to 100,000 times greater than an infra-red spectroscope, should permit quick and accurate measurements on minute isotopic samples.

Quantum mechanics, observes the National Bureau of Standards, must be used to calculate and design such apparatus, and the absorption by ammonia gas is typical quantum mechanical effect incapable of explanation by classical physics. The ammonia molecule, pyramidal in structure, with the three hydrogen atoms forming the triangular base and the nitrogen atom at the apex, continually turns itself inside-out, giving rise to a quantum-mechanical resonance absorption. The atomic clock is thus another example of the importance of atomic physics to engineering.

The overlapping of the fields of electronics and microwave physics may well provide a new technique for opening up the millimeter-wavelength bands above the region where ordinary microwave methods are applicable and below the region of optical methods.

A CEMENT RECORD

THE highest output of Portland cement ever achieved was attained last year with a total of 8,521,543 tons. This record, set up with less capacity than in 1939, nevertheless exceeded the figures for that year by 3.8 per cent.

An important part in the export drive was played by the industry, which exceeded the target of 1.5 million tons by 128,000 tons.

With new works and extensions it is hoped to increase production to nine million tons during the current year, with an export target of two million tons.

Paying a tribute to the achievement of the workers in the industry, Lord Selborne, chairman of the Cement Makers' Federation, referred to the survey of productivity made by the International Labour Organisation (THE CHEMICAL AGE, *59*, 712), which showed that this was the only British industry in which the British worker excelled the American.

Progress in Medicinal and Fine Chemicals—III

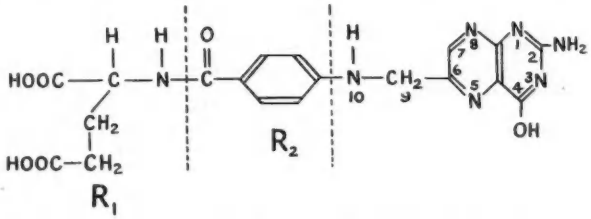
Promising Studies of Folic Acid

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE chemical structure and characteristics and the clinical applications of folic acid are now well recognised, thanks largely to the work of Spies and his collaborators.

Progress in this, up to 1947, was recorded in "Experiences with Folic Acid" (I. D. Spies; The Year Book Publishers, Inc., Chicago), affording the most complete bibliography at that time.

Folic acid, which has been synthesised by Angier *et al.* (*Science*, 1946, *103*, 667) is pteroic-glutamic acid :—



It will be seen that it results from the condensation of three moieties, of which the pterin nucleus on the right and *p*-aminobenzoic acid in the middle form pteroic acid. Pteroic acid is condensed with one molecule glutamic acid in folic acid, which is the *Lactobacillus casei* factor of liver.

Pteroic acid, however, may be found occurring naturally with more than one glutamic acid residue, as in the fermentation *Lactobacillus casei* factor, in which folic acid is conjugated with two *additional* glutamic acid residues.

The "Vitamin B_c" conjugates, isolated from yeast by Pfiffner *et al.* (*Science*, 1945, *102*, 228), have been found to be pteroyl-hexaglutamyl-glutamic acid.

Folic Acid Synthesis

Fuller details of a number of methods of synthesis of folic acid have been revealed by Angier and his associates in a series of papers published in 1948 (*J. Amer. Chem. Soc.*, 1948, *70*, 128).

The existence of *p*-aminobenzoic acid in the folic acid molecule is interesting, because it will be recalled that, in 1940, Fildes and Wood demonstrated that the mechanism by which sulphonamides worked as bacteriostatic substances involved a preferential absorption by an enzyme system, thus blocking it for the essential metabolite *p*-aminobenzoic acid. It was in this important discovery that a rational basis for chemotherapy first appeared.

Sulphonamide Interference

Forrest and Walker (*Nature*, 1948, *161*, 721) have now suggested that it is in the biosynthesis of folic acid (which incorporates *p*-aminobenzoic acid, as has been seen) by bacteria that sulphonamides interfere and thus produce their bacteriostatic effect.

More specifically, the naturally occurring strongly reducing substance, reductone, is believed to take part in the synthesis of pteroic acid (in which its structure is implicit); and it is in competition with the essential metabolite *p*-aminobenzoic acid for reductone that sulphonamides act bacteriostatically, because by their incorporation they form biologically most analogues of pteroic acid.

Several variants on the folic acid structure have been synthesised and these have opened new, wide vistas, including the possibility of eventually affording means to control some forms of cancer.

Leuchtenberger and his colleagues (*Proc. Soc. Exp. Biol.*, N.Y., 1944, *55*, 204; *Science*, 1945, *101*, 46; *ibid.*, 1946, *104*, 436) first demonstrated that *Lactobacillus casei* factor (pteryldiglutamyl glutamic acid) inhibited the growth of a sarcoma transplanted into mice. A regression was found in 30-40 per cent of the animals injected with the factor. Folic acid, on the other hand, showed no such action.

During 1948, Little *et al.* (*Trans. N.Y.*

Acad. Sc., 1948, *10*, 91) found that a diet lacking folic acid prevented the development of Rous sarcoma in all baby chicks so infected. They found that when folic acid, N-methyl-folic acid, pteroyldiglutamyl- or pteroyltriglutamyl-glutamic acid was made available the sarcoma developed. But it was found that if folic acid containing *d*(−)glutamic acid, or pteroylaspartic acid, or pteroic acid, or N-methyl pteroic acid or *p*-amino-benzoyl-triglutamic acid were injected no tumours developed; none of these substances was able to replace folic acid.

Cancer Investigation

Finally, when 4-amino-folic acid with *d*(−)glutamic acid in the molecule was administered to chickens infected with Rous carcinoma at the rate of 400μg: per diem, the development of tumours was prevented; only half the birds developed tumours with a daily dose of 200μ.

A number of these chemical substances has now been tried in human cancer cases in the U.S.A. In the first, teropterin (pteroyl-γ-glutamyl - γ - (glutamyl - glutamic acid) and diopterin (pteroyl-α-glutamyl-glutamic acid) were investigated clinically. The former is said to have given the most promising results (Lehr, *et al.*, *Trans. N.Y. Acad. Sc.*, 1948, *10*, 75).

Pteropterin, a stable, yellow powder, soluble in saline and previously found to be non-toxic in animals, was injected without pain in advanced cases of human cancer. However, according to Dodds (*Lancet*, 1948, ii, 834) who recently visited the U.S.A., the results are somewhat in doubt and opinion is divided as to the extent to which folic acid variants do, indeed, affect the course of cancer.

Interest, he indicates, has shifted from di- and tri-opterin to folic acid antagonists—*i.e.*, substances with similar spatial arrangements but with slight differences in structure. These act by being absorbed on to the enzyme surface and blocking it to the essential metabolite, which they resemble, and thus holding up bio-synthetic processes.

Evidence exists that, without folic acid, cells can exist for a few hours only. Malignant cells appear to be more sensitive to such deprivation than normal cells. It has been suggested, therefore, that by suitable treatment with folic acid antagonists it might be possible to damage the malignant cells irreparably without affecting the normal cells beyond power of recovery.

The following are reported to have been undergoing clinical tests:—

(a) Aminopterin: With amino groups in 2- and 4-positions of pteroic acid moiety slight but definite inhibition was obtained with spontaneous and transplanted tumours. It may also prove an anti-œstrogenic substance. Very toxic.

(b) A-methopterin: With amino groups in the 2- and 4-positions and a methyl group at N_{10} in the pteroic acid moiety. This substance is anti-folic acid, anti-œstrogenic, inhibits growth of tumours in animals and malignant cells in tissue cultures.

Dodds was informed that encouraging results had been obtained in clinical trials by the American workers he visited.

Whether this approach to the problem of cancer holds promise for clinical success remains to be seen. As Fildes has pointed out (*Nature*, 1948, *182*, 356) the metabolic patterns of parasite and host are so similar that metabolic agents interfering with the life-processes of the parasite are likely to interfere similarly with the life-processes of the cells of the host. Consequently, the development of chemotherapeutic agents has been strewn with disappointments when what has appeared to be a supremely efficient chemotherapeutic agent against the parasite *in vitro* has proved of little or no value *in vivo* due to this toxicity.

(*To be continued*)

Analgesic Potency of Heptalgin

Glaxo Laboratories, Ltd., Greenford, Middlesex, has announced the introduction of the new analgesic Heptalgin. This is 4-4 diphenyl 1-6-morpholinoheptan-3-one-hydrochloride and was evolved and synthesised in the Glaxo Research Laboratories.

The analgesic potency of Heptalgin as demonstrated by extensive animal tests and with human volunteers is stated to be about six times that of morphine, twenty times that of pethidine and at least three times that of amidone. The acute toxicity of Heptalgin, in relation to its analgesic activity, was much lower than that of other analgesic substances. It is selective and produces little or no cortical depression, and hypnotic effects have not been noticed.

Extensive evidence will be needed before it is possible to show absolute absence of habit formation, but early experience is stated to have suggested that addiction is improbable.

Administered orally, Heptalgin acts within 15 to 30 minutes and relief usually lasts three to four hours

MAGNETIC MEASUREMENT OF COATINGS

Further Development of Non-Destructive Principles

USING the measurement of the attractive force between a plated specimen and two permanent magnets of different strengths, Abner Brenner and Eugenia Kellogg, scientists at the U.S. National Bureau of Standards, report the development of a convenient, non-destructive magnetic method for determining the thickness of composite copper-nickel coatings electrodeposited on steel. The values thus obtained are used, in conjunction with a set of previously determined calibration curves for each magnet, to obtain the total thickness of the coating and the relative thickness of the copper and nickel layers.

As the protective value of composite coatings depends largely on their thickness, it is important to have a convenient means for measuring this property. The magnetic method just developed eliminates the necessity of cutting the specimen and is easily and rapidly applied.

The method utilises the principle of the Magne-gage, originally designed at the bureau to measure the thickness of single electrodeposited coatings on the basis of the attraction between a small permanent magnet and the plated sample.

This is essentially a spring balance, on the arm of which a magnet is suspended in contact with the coated surface. A helical spring is so attached that, when wound by means of a knob, it exerts a force tending to detach the magnet from the surface. If, as is ordinarily the case, the coating is less magnetic than the object plated, the required force, as indicated on a dial adjacent to the knob, will be greater for thinner coatings.

Composite Coatings

For measurement of composite coatings, the Magne-gage is modified by the use of two magnets of different strengths. A set of calibration curves for each magnet—total thickness against dial readings—is plotted on transparent material for coatings of successively varying known proportions of copper and nickel. After readings are taken with each magnet on the composite coating under study, one set of calibration curves is superimposed on the other, so that the values of the two separate dial readings on the horizontal scale for each magnet are brought into coincidence.

A straight line is drawn joining points of intersection of curves of the same percentage composition. If a second line is then drawn, perpendicular to the horizontal scales of the graphs, through the point representing the dial readings, it will intersect the first line in a point corresponding to the thickness of the total coating. The relative thicknesses of the copper and nickel layers are also obtained by graphical interpolation along the line joining the intersection points of the curves of equal composition.

In this way, total thicknesses of composite coatings ranging from 0.0005 to 0.003 in. can be determined within about 10 per cent. The thickness of each component layer of similar coatings can be measured to an accuracy of about 15 per cent.

Compactness and relative simplicity are characteristics of Magne-gage

Magnetic Mineral Survey

The latest development in geophysical prospecting is to be used by one of Australia's biggest mining companies in a six months' survey of new mineral deposits. This is the air magnetometer, which is being flown from South Africa by the Air Charter Survey and Exploration Company for the Zinc Corporation of Australia, Ltd. The device will be used from an aircraft guided over selected areas by radar. It is considered to be of considerable importance in locating minerals with a magnetic influence and has been used successfully in some countries in the search for oil, gold, and iron ore. The Zinc Corporation is bringing in 16 South African geophysicists.

CAKING OF FERTILISERS

Results of Research by the CRL

by G. R. DAVIES, M.Sc., Ph.D.; J. B. DITCHAM, and W. S. GREAVES*

THE short term study of methods of minimising the caking of fertilisers, which has been carried out during the past eight months, has indicated clearly that the addition of conditioners having a high bulk density, such as peat, straw or sawdust, can exert a definitely beneficial effect. In amounts of the order of 3 per cent these substances may be expected to prevent any serious caking of compound fertilisers under reasonable storage conditions, while even under bad conditions they still cause a notable reduction.

With the advent of war, the production of fertilisers increased to such an extent that it was not possible to allow adequate time for maturing the products and subsequent re-grinding. Consequently, serious troubles have been experienced with caking of the material.

Discussion with Industry

Arising from these the Board of Trade consulted the Chemical Research Laboratory on the problem. It was felt by us that the matter should first be discussed with the industry through the fertiliser Manufacturers' Association, and a meeting was held on November 5, 1946, between representatives of the association, the Board of Trade, and the CRL.

It was agreed that a short-term investigation should be instituted to try to overcome or minimise the troubles due to caking and that, if possible, the results should be available by the autumn of 1947.

Work was, therefore, commenced towards the end of December, 1946, and was terminated at the end of July, 1947.

Since the problem has been most acute in the powdered compound fertilisers, our efforts have been largely directed to the No. 1 National Compound, the formula of which, with the analysis of materials supplied to us, is as follows:—

	Per cent
Sulphate of ammonia	34
Superphosphate	37
Muriate of potash	17.5
Sand	11.5

Study of the chemistry of such a system would entail a long programme of research, while attack from the point of view of coating the fertiliser particles would involve an aqueous or oily mix, followed by drying in the case of an aqueous mix. Under such conditions it would be as easy to granulate the material.

We, have, therefore, confined ourselves to a search for powdered conditioning agents which could be added during dry mixing, bearing in mind that they must be harmless to plant or soil, that they should be cheap, having an approximate price of £2 per ton, and that they should be available in the United Kingdom, if possible in quantities of 10—15,000 tons a year. Not all the substances tried out would fulfil these conditions, but it was essential to examine a sufficient range to obtain some idea of the types of material which might be serviceable.

It has been found in practice that caking is worst where the pressure is greatest, that is, in the bottom bags of a stack. The fertiliser, during the period of storage, is subjected to a pressure which is approximately 1½ lb. p.s.i. per yard of stack height. It is unlikely that a stack, even on large farms, would be more than ten bags high, corresponding to an approximate pressure of 15 lb. p.s.i. at the bottom. To obtain an accelerated caking, we decided to form test cakes of fertiliser compound with and without conditioners, under approximately four times this pressure for a short period of time, and then to store the cakes under varying conditions of temperature and humidity.

Fifteen grams of the experimental mix was filled into a mould of 1 in. diameter and a weight of 50 lb. was applied to the piston for 10 minutes, this being equivalent to a pressure of 63.3 lb. p.s.i. The cake was then carefully removed for storage.

Required Pressure

A few days after preparation, and at intervals throughout the period of storage, caking was determined by measurement of the pressure required to crush the cake.

All the materials, fertiliser and conditioner, were ground finely to pass through a 30 mesh sieve, the conditioners being present in concentrations of 5 per cent, and replacing that amount of sand in the origial formula. Test cakes were then made and stored in a constant temperature-constant humidity chamber. Some difficulties were experienced initially with the setting of this chamber, but eventually

* Of the Chemical Research Laboratory, Dept. of Scientific and Industrial Research, in a paper presented before the Fertiliser Society on January 12.

The authors acknowledge their indebtedness for collaboration and facilities to Fisons, Ltd., and Mr. J. W. Napier, Dr. G. F. New of the Fertiliser Manufacturers Association and Mr. J. Hirst (Board of Trade).

constant conditions at 25°C. and 65—70 per cent relative humidity were obtained. The variations experienced in the early stages of this series of experiments were as follows:—

2 weeks at 30°C. and 34 per cent R.H.

3 weeks at room temperature and 34 per cent R.H.

1 week at room temperature and room humidity (37—88 per cent R.H.).

Thereafter at 25°C. and 65—70 per cent R.H.

In Table 1 figures are given for the crush weights required after 135 days' storage.

Under these conditions it will be seen that after storage for 130-140 days the best materials are peat, powdered seaweed, fish meal, dried blood and pulverised fuel ash, in that order.

Only a few cakes containing wood meal were prepared for this series, but from later experiments there is no doubt that had a sufficient number of cakes been made the final results would have been the same as for peat. It is interesting to note also that the figures for peat seem to be independent of its moisture content.

TABLE 1.

Weight required to crush cakes after 135 days storage

NATIONAL COMPOUND No. 1.	lb.
A	180
B (5 per cent treated leather waste)	145
C (5 per cent fish meal)	114
D (5 per cent powdered seaweed)	102
E (5 per cent dried blood)	120
F (5 per cent fine stone dust)	290
G (5 per cent superfine stone dust)	300
H (5 per cent pulverised fuel ash)	120
I (5 per cent peat 3 per cent moisture)	96
K (5 per cent peat. 21 per cent moisture) ...	90

Since the muriate of potash and the sulphate of ammonia were in the form of quite fine crystals it was decided in the second series of experiments that in future they would be used unground, apart from breaking up any lumps or aggregates. The superphosphate was already in the form of a finely ground powder.

Grinding Conditioners

For the sake of uniformity, all the conditioners were ground or suitably reduced in size where this was necessary and, in the present series, they were again added to the mixes in the proportion of 5 per cent.

Storage was in a large cupboard in a ground floor room so that the cakes were exposed to the natural variation of temperature and humidity within this particular room.

It is plain, from graphical results, that dried blood, fish meal and seaweed still have a good anti-caking effect, but that the effect of pulverised fuel ash, under these conditions, is comparatively slight. Peat and wood meal again are outstanding as good agents. Cakes made with them, although formed under 63 lb. p.s.i. and stored for 120 days are easily broken up by pressure of the fingers. Table 2 shows the weight required to crush the cakes after storage for 120 days.

TABLE 2

Weight required to crush cakes after storage for 120 days:

NATIONAL COMPOUND No. 1	lb.
A	95
B (5 per cent treated leather waste)	60
C (5 per cent fish meal)	50
D (5 per cent powdered seaweed)	52
E (5 per cent dried blood)	62
F (5 per cent fine stone dust)	120
G (5 per cent superfine stone dust)	140
H (5 per cent pulverised fuel ash)	80
I (5 per cent peat, 3 per cent moisture) ...	22
M (5 per cent wood meal)	20
N (5 per cent boiler ash)	104
O (5 per cent coal dust)	101

Percentages Added

The experiments in this series were designed to study the effect of varying the percentage of conditioners added to the No. 1 Compound Fertiliser. These were 1, 3, 5 and 7½ per cent respectively of the following conditioners: acid treated leather waste, fish meal, powdered seaweed, dried blood, fine stone dust, pulverised fuel ash, peat and wood meal. Storage conditions were the same as in the second series of experiments.

Some of the results are anomalous. In one or two cases the caking is apparently harder with slightly more conditioner, while with dried blood, caking is somewhat more severe with 1 per cent of conditioner than with none at all.

Generally, however, the pattern is as one would expect and with increased wood meal or peat up to 7½ per cent it is difficult to form a cake under 63 lb. p.s.i. pressure. Where such cakes were formed, by the exercise of great care, it was almost impossible during the first weeks of storage to pick them up. The lightest touch of finger and thumb caused collapse.

In the fourth series the conditioners were added in amounts of 3 per cent, but storage in this instance was at 25°C. and 65—70 per cent relative humidity. Two new materials were included:—

P Brick dust.

SL Dried sewage sludge.

In these experiments all the cakes were harder than under the conditions prevailing in the two previous series. The strongest anti-caking effects were again shown by peat and wood meal.

Table 3 shows the crush weights necessary after 90 days storage.

(*Continued overleaf*)

TABLE 3.

Weight required to crush cakes after storage for 90 days:

NATIONAL COMPOUND NO. 1	
A	165
B (3 per cent treated leather waste)	94
C (3 per cent fish meal)	124
E (3 per cent dried blood)	120
H (3 per cent pulverised fuel ash)	138
I (3 per cent peat, 3 per cent moisture) ...	54
M (3 per cent wood meal)	50
SL (3 per cent dried sewage sludge)	150
P (3 per cent brick dust)	180

Particle Size

In all experiments wood meal and peat were shown to be the most effective conditioners, so the fifth series was aimed at studying the influence of particle size on the anti-caking efficiency of wood meal, and to determine whether there was any optimum particle size. Several grades of screened wood meal were already available, and these were added in amounts of 3 per cent. Storage was under controlled conditions at 25°C. and 65—70 per cent relative humidity. The results are set out in graph form, showing incidentally that the following grades of sawdust were employed:—

A Normal sawdust with large pieces removed by hand.

B Normal sawdust with fines below 30 mesh removed.

C Sawdust less than 30 mesh.

D Wood meal 30-180 mesh.

E Wood meal 180-240 mesh.

F Wood meal less than 240 mesh.

Over the wide variation of particle size there is surprisingly little difference in regard to anti-caking effect. No optimum size can be decided on and all grades under test were approximately equally good.

The cakes containing wood meal or peat, although of the same weight as cakes containing other materials, were quite noticeably larger. In the sixth series bulk density determinations were therefore carried out by mechanically tapping, for five minutes, a measuring cylinder containing a known weight of conditioner. Results are given below as c.c. per g.:—

Pulverised peat	6.0
Wood meal, 30 mesh	6.0
Wood meal, 30-180 mesh ...	4.8
Wood meal, 180-240 mesh ...	4.8
Wood meal, 240 mesh	4.5
Fish meal	1.3
Powdered seaweed	1.3
Dried blood	1.2
Pulverised fuel ash	1.04
Penlee stone dust, fine ...	0.8
Penlee stone dust, superfine	0.7

The most effective materials throughout have been those of high bulk density. Straw, as a similar material, was therefore tried at 3 per cent. Two grades were obtained:—

(1) A very light, fluffy material, by passing straw twice through a disintegrating machine, and

(2) A material equivalent to a finely chopped straw, by passing only once through the disintegrator.

Storage was under controlled conditions at 25°C. and 65—70 per cent relative humidity.

The best results were obtained using the fine grade, but even finely chopped straw showed strong anti-caking properties. A comparison under the same conditions of storage with wood meal and peat is given in Table 4.

TABLE 4.

Weight required to crush cakes after 90 days:

	lb.
NATIONAL COMPOUND NO. 1	165
(3 per cent peat)	53
(3 per cent wood meal, 30 mesh)	50
(3 per cent straw, fine)	48

Three grades of hard, gritty material obtained from the purification of china clay, containing mica, with some quartz, decomposed felspar, kaolin and 3—5 per cent of K_2O were employed in the seventh series and, giving no indications of promise, the experiments were terminated after 80 days. Weights required to crush the cakes at that point were:—

NO. 1 COMPOUND	lb.
+ 3 per cent fine Mysil	192
+ 3 per cent Agrafil	120
+ 3 per cent N.R.D.	144

Experiments were also made with lubricating oil and graphite powder. The latter material, at 3 per cent, had no effect at all and lubricating oil, of the medium motor grade, effected a reduction in crush weight from 170 to 110 lb. Three per cent oil is not easy to mix with a bulk of powder, so in a further trial the same quantity of oil was added in a large bulk of light petrol ether and thoroughly mixed with the powdered fertilisers.

Other Materials Effective

After removal of the petrol the anti-caking effect was much more apparent, resulting in a crush weight of only 54 lb. being required after 80 days.

This method is obviously not feasible, but it does show that other materials than bulky solids can be effective if the difficulties of mixing could be overcome.

In all previous experiments the superphosphate used had been made for three months or more and was therefore matured.

In the eighth series of experiments attempts were made to determine the effects of using 3 per cent peat or wood meal in a No. 1 Compound made up with superphosphate which had been manufactured only

a few days previously. Other conditioners were also used for comparison.

This series was run only for some 40—45 days, but it was already obvious that an appreciably greater hardening had taken place than with the more mature superphosphate as may be seen from the figures given in Table 5. Storage was at 25° C. and 65—70 per cent relative humidity.

TABLE 5.

After 40-45 days storage	No. 1 CPD with old Superphosphate lb.	No. 1 CPD with new Superphosphate lb.
No conditioners... ...	155	180
3 per cent leather dust ...	80	120
3 per cent fish meal ...	120	138
3 per cent dried blood ...	108	160
3 per cent pulv. fuel ash	138	170
Peat	50	75
Wood meal	45	70

In the ninth series storage was under the worst possible conditions. Half of a series of cakes, containing 5 per cent of conditioners, was stored in a wooden shed, covered with galvanised iron, but with one wall partly open to the outside atmosphere. The other half was stored in an underground air-raid shelter.

Storage was begun in the severe winter conditions of the early part of 1947 and continued through the subsequent thaw and flood periods. Under these conditions the cakes became saturated with water and each one was, within a week, standing in its own little pool of water on the glass storage plate.

Drying Out

In the group stored in the shed, there was considerable drying out during June and July, and some comparison was now possible after 140 days storage. Figures are given in Table 6. That a considerable amount of moisture was still present was shown by a slow collapse of the cake at the critical pressure rather than by a quick reduction to a powder.

TABLE 6.

NATIONAL No. 1 COMPOUND	Weight required to crush 300 lb. lb.
+ Coke boiler ash	240
+ Pulv. fuel ash	216
+ Fish meal	186
+ Seaweed	156
+ Wood meal	90
+ Peat	70
+ Leather waste	42

It was impossible to test any leather-containing cakes, as in the 100 per cent humidity of the shelter they had collapsed and become sodden, irregular heaps; all the other materials, although saturated, retained the mould formation.

It is also significant that of the group stored in the shed, which were also saturated, but not for the same length of time, leather should have such a good effect.

It is concluded that where conditions of storage are reasonable, caking of the compound fertilisers can be minimised if not entirely prevented by the addition of a small proportion of peat or wood meal. Where storage conditions are so bad that the sacks can actually become saturated, wood meal or peat still exert a beneficial effect, although not to the same extent as under reasonable storage.

No. 2 Compound

One group of experiments has been made (Series 10) with the No. 2 Compound, which contains a larger proportion of sulphate of ammonia, almost an equal proportion of superphosphate, and less than half as much muriate of potash as No. 1 Compound.

Conditioners were added at 3 per cent of the cake by weight and storage was at 25° C. and 65-70 per cent relative humidity. The results show again that the most effective conditioners are peat and wood meal.

It is realised that the work embodied in this report has had to be carried out rather hurriedly and that consequently the number of materials which could be tried out and experiments made, have not been as large as we should have liked. Moreover, we have only been able to deal with mixtures on a small scale.

It is felt, nevertheless, that the results are significant and that they show quite definitely that the most effective anti-caking agents are those having a high bulk density.

Finely divided inorganic materials seem in many cases to increase caking. The most beneficial results under a variety of conditions have been given by peat and sawdust. Both these substances are suitable for incorporating in fertilisers; peat has been widely used for horticultural purposes, while, according to the opinion of Dr. Crowther, of Rothamsted, and of Dr. Wilson, of the Midland Agricultural College, sawdust, in the amounts contemplated, would have no adverse effects on plants or soil.

We would draw attention also to the value of good storage conditions in minimising caking. With fairly good indoor storage such as prevailed in our second and third series of experiments the crush weights were appreciably lower than when a steady, and fairly high humidity was employed.

Where saturated conditions were allowed to exist for any length of time the caking was appreciably greater. Quite independently of the possibilities of conditioners we feel that the attention of those concerned should again be drawn to this point.

THE LAW AND POLLUTION

Increasing Vigilance

by G. R. NELLIST, F.R.I.C.

This was once a clean stream which, having passed through a factory, emerges to join the waterways in this condition, leaving a growing deposit at the outfall

INTEREST in pollution problems has quickened since the end of the war. The legal position is being reviewed as part of the national water policy, while the various authorities responsible for the prevention of pollution are becoming more vigilant in their protection of waters under their charge. The British Field Sports Society has been trying to arouse the public conscience and reveal the serious extent of pollution in a series of booklets, two of which were published last year.[1] The daily Press has also taken up the theme.

These publications stress the deterioration in the country's waterways brought about by the effects of sewage and more particularly of industrial effluents. They recall that industrial development between 1880 and 1914 reduced the River Trent and its Staffordshire tributaries to little better than open sewers.

On the Tyne, some 30 million g.p.d. of untreated sewage enters the tidal waters from 268 outfalls between Wylam and the sea. This moves up and down the estuary, taking several tides to clear. The trouble has been accentuated by increased extraction of fresh water from the upper reaches.

Trade wastes have extinguished practically all life in the Calder, a tributary of the Ribble, which appears to have lost the power of self-purification. Codfish without eyes have been caught in Morecambe Bay, the injury being attributed to the corrosive effect of an acid effluent. Effluent from a sugar-beet factory is suspected of causing a seasonal growth of sewage fungus in a tributary of the Severn.

"Open Sewers"

The estuaries of the Mersey and the Tees are notorious "open sewers." Both of these rivers have been the subject of investigations by the Department of Scientific and Industrial Research.[2,3] The rivers of the West Riding of Yorkshire were another "black" spot, but in the 50 years' existence of the West Riding Rivers' Board, much improvement has been effected by provision of proper treatment of domestic sewage and industrial effluents.[4]

Existing statute law regarding pollution is contained in the Rivers Pollution Prevention Acts of 1876 and 1893, together with the Salmon and Freshwater Fisheries Act of 1923.[5,6] The Public Health Act of 1936 made practically no change in the general position regarding the disposal of trade wastes. A number of other public local and general Acts are concerned with river pollution.

The waters protected (called "streams" in the 1876 Act) comprise non-tidal rivers, streams, canals, lakes and water-courses. Tidal waters, and even the sea, may be included by order of the Minister of Health made on "sanitary" grounds.

Under Section 55 of the Salmon and Freshwater Fisheries Act, the powers of the 1876 Act may be extended to tidal waters for the protection of fisheries. Such orders have been made in ten cases and the Prevention of Pollution Sub-Committee of the Central Advisory Water Committee is considering whether the Act should be extended to include all tidal waters.

In the absence of any prescriptive right to the contrary, a riparian owner is

entitled to receive the flow of water in a stream in its natural state as to quality and quantity. Where he suffers damage in law by an infringement, *e.g.*, by pollution, the riparian owner has a right of action.

Under the 1876 Act it is an offence :—

(1) to put solid matter into a stream so as to cause pollution or interference with the flow;

(2) to discharge solid or liquid sewage into a stream;

(3) to discharge into a stream poisonous, noxious or polluting liquid proceeding from a factory or manufacturing process. (Innocuous discoloration does not constitute pollution.)

There are reservations where the discharge is through a channel in use in 1876, or a channel in substitution thereof.[7] Under the Prescription Act of 1832, 20 years' use conferred a prescriptive right to pollute which became absolute in 40 years. No such right exists, however, where an Act of Parliament forbids pollution of a particular watercourse, nor can the right to pollute be acquired if such pollution would result in injury to public health. Since 1876 no prescriptive right can be acquired on streams to which the Rivers Pollution Prevention Act applies.

Water pumped from mines is exempt from the provisions of the Act provided it is disposed of in the same condition as that in which it was raised or drained from the mine.

The enforcement of the Act rests with the sanitary authorities; in England and Wales these are the borough, urban and rural district councils. The Local Government Act of 1888 conferred the powers of sanitary authorities upon county councils, which thus exercise concurrent jurisdiction with the local authorities in their counties.

By provisional order of the Minister, joint committees can be formed. This has been done in four cases, namely, the West Riding of Yorkshire Rivers Board, the Mersey and Irwell Rivers Board, the Lancashire Rivers Board and the River Dee Joint Committee. It is the intention of the Government to vest these powers in the rivers boards which they propose to establish.

Proceedings against offenders may be instituted by the sanitary authority or (subject to certain restrictions) by any person aggrieved by the commission of the offence. Actual pollution must be proved. Such an action is heard in the county court.

The consent of the Minister of Health must still be obtained before proceedings can be taken in respect of manufacturing pollutions. The Central Advisory Water Committee rejected a strong plea by the

Some of the thousands of fish found dead through pollution—previously unsuspected—in a lake at St. Paul's Cray (Kent), fed by the River Cray. Twenty-one years ago the lake was stocked with perch, dace, carp, roach, rudd, bream and chubb

sanitary authorities that this requirement should be withdrawn (7, para. 74b). Before giving his consent, the Minister must have regard to the industrial interests involved and be satisfied that the means for rendering such liquid harmless are reasonably practicable and available under all circumstances of the case.

Two months' written notice must be given to the offender of any intention to take proceedings, while concurrent proceedings for the same offence are not permitted. Objection to such proceedings being taken may be laid before the local authority, which must afford the respondent an opportunity of being heard.

Compliance with Orders

In successful proceedings, a summary order of the court will require the offending party to refrain from committing the offence. Before making such an order, the court may call for an expert report on the "best practicable and available means." For non-compliance with the order a penalty of £50 per day may be imposed, while there is a "default" procedure for ensuring eventual compliance.

The court's order may be rescinded or suspended on conditions, while an appeal may be made, by way of case stated, to the Court of Appeal, not only on a point of law but also "on the merits."

The great weakness of the law regarding pollution is that no standards are laid down governing the purity of effluents which may be discharged into protected waters. In only two cases has Parliament inserted standards in any local Act[6], namely, suspended solids, 30 p.p.m.; 5-day B.O.D. at 65°F., 20 p.p.m.

Even the Thames Conservancy Act does not prescribe any standards of purity, although an effluent usually is considered to infringe if the above standards are exceeded or if the albuminoid ammonia exceeds 2 p.p.m.

Typical limit figures are as follows: suspended solids, 60 p.p.m.; 5-day B.O.D., must not reduce the oxygen-saturation of the receiving waters below 50 per cent; colour, there should be no appreciable difference between the effluent and the receiving waters.

As far as chemical works effluents are concerned, no limits are laid down for specific poisons. Even the experts fail to agree upon the minimum lethal dosages. This is not surprising, seeing that different investigators have worked with fish of different species and sizes and have not always appreciated the full significance of differences in water composition and variations in *p*H.[9]

The toxicity of ammonium compounds, for example, varies greatly with the *p*H of the water; ammonium hydroxide is the most toxic of the ammonium compounds and its concentration in a particular water is a function of the *p*H.

The subject of the toxic limits is too wide a field for discussion in one article. Much valuable information on the toxicity of pure substnces and of particular trade effluents is to be found in the works of Ellis[10], Brandt[11], Weigelt[12], Schaut[13] and others.

The following figures may be taken as a general guide, but it must be borne in mind that the actual permissible limits can be fixed only according to the circumstances of each particular case:—

*p*H	5.0–9.0
Sulphuretted hydrogen	1 p.p.m.
Cyanide	2 p.p.m.
Phenols	2 p.p.m.
Thiocyanate	1,000 p.p.m.
Free ammonia	10 p.p.m.
Ammonium sulphide	10 p.p.m.
Ammonium carbonate	100 p.p.m.*
Other ammonium salts	1,000 p.p.m.
Copper	1 p.p.m.
Arsenic	6 p.p.m.
Free chlorine	1 p.p.m.
5-day B.O.D. at 20°C.	20 p.p.m.

*Depending upon *p*H

The figure of 6 p.p.m. for arsenic is below the usually accepted toxic limit for fish, but is a safeguard against bathers and domestic animals.

Treatment of Effluents

It is not the purpose of this article to discuss methods for the treatment and disposal of effluents. Information on this subject can be found in references [5] and [14—21].

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Personal News and Appointments

THE departure, recently announced, of DR. H. K. WHALLEY from the Chemical Research Department at Manchester Oil Refinery, Ltd., is to enable him to join Petrocarbon, Ltd., at the end of this month to be in charge of programme and planning of Petrochemicals, Ltd. Dr. Whalley joined M.O.R. in November, 1945, and for four years has directed an intensive research programme, making a particular study of the application of petroleum-derived chemicals. He is achieving outstanding results in the development of petroleum sulphonates. He served formerly (from 1932) in the Government Chemist's Department, and during the war acted an the scientific staff of the Ministry of Supply as assistant director of chemical research and development.

DR. F. A. FOX has relinquished his appointment as deputy director of the British Welding Research Association and is joining H. J. Enthoven and Sons, Ltd., as deputy technical manager. His new address will be 15 Lime Street, London, E.C.3.

MR. EDWARD A. O'NEAL, Jnr, managing director of Monsanto Chemicals, Ltd., has been appointed also chairman of the board of directors in succession to DR. L. F. NICKELL, whose resignation was recently announced. In February, 1946, Mr. O'Neal came to Great Britain from the U.S.A. as deputy managing director of Monsanto Chemicals, Ltd., and in April, 1947, was appointed managing director. His genius for organisation, which was called into service on several government projects in America during the war, proved invaluable when he joined the British organisation just prior to the launching of the extensive development programme, the company reports.

Mr. E. A. O'Neal, Jnr.

Sir Ellis Hunter

The British Iron and Steel Federation announces that SIR ELLIS HUNTER has been re-elected president of the federation for the forthcoming year. Sir Ellis is chairman and managing director of Dorman, Long, and Co., Ltd. MR. G. H. LATHAM, chairman of the Whitehead Iron and Steel Co., Ltd., has been reappointed past-president, and MR. N. H ROLLASON, managing director of John Summers and Sons, Ltd., re-elected as president-elect.

DR. LAWRENCE R. HAFSTAD, who was among those first associated with splitting the uranium atom in America, is to head America's attempt to produce atomic-power units for ships and aircraft. He will be in charge of the programme to design and develop nuclear reactors to drive ships and planes, produce radioactive isotopes for medical purposes, and to carry out research on reactors themselves.

MR. CHARLES SMITH has been appointed a local director of John Smith (Keighley), Ltd., the Yorkshire crane makers. A grandson of John Smith the founder of the firm, which was established in 1866, the new director has been with the company more than 30 years.

The retirement of DR. J. VAN NOSTRAND DORR and the appointment as his successor as president of MR. ELMER R. RAMSEY, reported last week, both referred to the Dorr Company of the U.S.A., not to the British undertaking, the Dorr-Oliver Co., Ltd., as stated.

Research Chemist's Dismissal

High Court Decision

IN the King' Bench Division of the Law Courts on January 24, Mr. Justice Jones heard a claim by Dr. Frederick Cecil Barron Marshall, research chemist, against Low Temperature Carbonisation, Ltd., alleging that he had been wrongfully dismissed on December 10, 1947. There was a counterclaim for damages for alleged breach of an implied term to serve the company.

One Month's Notice

In support of the plaintiff's claim, Mr. J. Scott Henderson, K.C., related that Dr Marshall had been appointed research chemist by the defendants at a salary of £700 a year and had served satisfactorily up to the time of his dismissal, when he was given one month's notice. When he had drawn attention to the established custom of giving three months' notice to a qualified chemist the company forwarded him the equivalent of seven weeks' salary. The plaintiff had not accepted this settlement and had asked for £187 10s. and the amount of his superannuation contributions.

It was stated the defendants had provided Dr. Marshall with a home, as a quarterly tenant, and that damages were sought because he had not relinquished it at the termination of his employment.

Dr. Marshall, in evidence, said he was a Doctor of Philosophy and a Bachelor of Science of London University, a Fellow of the Royal Institute of Chemistry, held the diploma of the Imperial College of Science and Technology and was a Fellow of the Chemical Society. Prior to joining the defendant company he had served as a senior research chemist at the Paint Research Station, Teddington, for two years, then as chief research chemist to a company, as technical director of a works dealing with shellac; he had carried out research for several years for the Ministry of Supply.

He confirmed that during his employment with the defendants he had established a new company, Barron (Chesterfield) Industries, Ltd., dealing with paints and enamels, to be operated by a relative and which he could supervise in his spare time. The director of research of Low Temperature Carbonisation was aware of this and had not objected at the time. The interests of the companies did not conflict. Cross examined by Mr. C. Salmon, K.C., for the defendants, Dr. Marshall agreed that Low Temperature Carbonisation had performed research on phenol formaldehyde resins. These were not of a type used in nitro cellulose lacquers.

Mr. Justice Jones, giving judgment after hearing further evidence from both sides, said he was satisfied the purpose of the company with which the plaintiff was associated was only to sell paint, notwithstanding that the objects were very widely stated in the memorandum. The plaintiff had never intended to be in the least disloyal to his employers. It was true that the defendants claimed to be interested in resins, which were mentioned in the objects of the plaintiff's company, and the defendants had shown that in the laboratory where the plaintiff worked was carried on work on solvents, chiefly for the rubber industry. A reasonable amount of solvents also was sold, some of which was for paint. There had been no concealment of the formation of Barron Indus-

(*Continued at foot of next column*)

tries, which went to show that the plaintiff had no intention of being disloyal.

Having regard to all the facts, he thought the dismissal of the plaintiff was wrongful, and that he was entitled to notice or three months' salary and was now entitled to damages.

His Lordship gave judgment for the plaintiff with costs on the claim and counter claim.

An application by the defendants for a stay of execution of judgment was granted, subject to the sum involved being paid into Court and notice of appeal given within 14 days.

Obituary

Distinguished Young Scientist Electrocuted

MR. GEOFFREY FERTEL, atomic research scientist, died as a result of an electric shock on January 20, while carrying out his duties in the physics department of Birmingham University. He was adjusting equipment in the Nuffield laboratory when he came into contact with a high-voltage cable carrying current from the smaller of the two cyclotrons.

Mr. Fertel, who was a research Fellow, took up his present research work at Birmingham a year ago. He was one of a team which produced a device which made it possible for high power short-wave radar sets to transmit and receive on the same aerial.

LORD MELCHETT, second Baron Melchett of Landford, in the County of Southampton, formerly deputy chairman of Imperial Chemical Industries, Ltd., died in Miami, Florida, last week. Aged only 50, he had been in poor health since 1947, when he resigned from the board, and went to live in America. Lord Melchett inherited from his grandfather, Ludwig Mond, a keen appreciation of science, and on the death of his father in 1930, he gave up his seat as an MP to devote his full time to economics and industry. Always keenly interested in technological development he believed that the creation of a kind of third House of Parliament, composed of Ministers, scientists, industrialists and other specialists, could solve the economic problem.

MR. BERNARD W. METHLEY, who has died at his home in Rotherham at the age of 72, was on the staff of Steel, Peech and Tozer for 46 years. On retiring from the position of chief chemist in 1947 he became a consultant to the Research and Development Department of the parent firm, The United Steel Companies, Ltd He was a past-president of the South Yorkshire and North Midland section of the Royal Institute of Chemistry, a Fellow of the Institution of Metallurgists, and a member of the Iron and Steel Institute and the Sheffield Metallurgical Association.

American Chemical Notebook

From Our New York Correspondent

ALTHOUGH lead consumers and the U.S. Government were supplied with more lead in 1948 than in any pre-war year, an amount equal to peak wartime consumption, the 1.1 million tons of lead consumed in 1948 fell short of total demand, according to the Lead Industries Association. The Government's stockpiling programme, involving purchases of 90,000 tons before June 30, added to topheavy civilian demand, created requirements that even increased production and imports were unable to meet. This resulted in a price spiral from 15 cents per lb. at the beginning of 1948 to 21½ cents per lb. in December. Of the total consumed, U.S. mines supplied about 380,000 tons, production from scrap accounted for about 450,000 tons, and imports for about 280,000.

* * *

Mr. David E. Lilienthal, chairman of the U.S. Atomic Energy Commission, has announced that the government will erect a new $70 million plant at Oak Ridge, Tennessee, for the production of uranium-235. Construction work on the new plant is expected to begin in about six months with at least 3500 construction workers on the job. It will take about two years and will increase "very substantially" the output of uranium-235 at Oak Ridge. Noting the commission's desire to step up efficiency in the Oak Ridge operations, so as to get more results with fewer people, the chairman said: "The gaseous diffusion plant at Oak Ridge is producing considerably more U-235 to-day than it did two years ago—with 4000 less people on the payroll."

* * *

Formation of a new division in the General Electric Research Laboratory, to be called the Crystallography Division, has been announced by Dr. C. G. Suits, vice president and director of research of the (U.S.) General Electric Company. The new division will be headed by Dr. David Harker, and its work will centre on problems of inter-atomic arrangement, particularly with respect to the structure of crystals. Such problems will entail the use of electron and X-ray diffraction instruments and the electron microscope. "Crystallography cuts across the fields of chemistry, metallurgy, electronics, and physics," Dr. Suits explained. "It seemed appropriate to create this new division rather than to fit our group into one of the previously-existing divisions."

An investment of about $3 million to expand facilities for the production of polyvinyl alcohols at its Niagara Falls, N.Y., plant is to be made by E. I. Du Pont de Nemours & Co. "This new plant," said Mr. Ross Hare, manager of the Niagara Falls works, "will make it possible to produce polyvinyl alcohols by a continuous process, instead of making them in batches as we do now." Polyvinyl alcohols are versatile synthetic resins for a great variety of industrial applications. By varying conditions of manufacture, a series of polyvinyl alcohols, each with different physical properties, can be made.

* * *

The Niagara Alkali Company last week announced that construction of its new plant at Niagara Falls for the production of trichlorethylene is now nearing completion. The plant is expected to be in operation early this year. According to Mr. J. C. Cassidy, president of the company, the manufacture and sale of trichlorethylene is in line with the firm's programme to provide greater diversification of its chemical products.

* * *

The Manufacturing Chemists' Association has just issued Chemical Safety Data Sheets SD-27 and SD-28, covering phosphorus trichloride and phosphoric anhydride, respectively, the 27th and 28th in the series of chemical product safety manuals prepared by the association. The manuals outline important physical and chemical properties of the products and cover all important points with regard to safe handling, storage, shipping containers, health hazards and their control. Copies of the manuals may be purchased at 20c. each from the Manufacturing Chemists' Association, 246 Woodward Building, Washington 5, D.C., U.S.A.

* * *

The Office of International Trade of the U.S. Department of Commerce has announced export quotas for the first quarter of 1949 for three chemicals. They are: chromic acid, 350,000 lb.; potassium bichromate and chromate, 900,000 lb.; and sodium bichromate and chromate, 3 m. lb.

* * *

Initial operation has begun at the partially completed ammonium sulphate plant of Phillips Chemical Company at Port Adams, Houston, Texas. About 150 employees are now working there and it is expected that approximately 200 people will be employed in the latter part of February.

A CHEMIST'S BOOKSHELF

Treatment & Disposal of Industrial Waste Waters, B. A. Southgate. H.M. Stationery Office. Pp. 327. 12s. 6d.

This is an authoritative work on a subject the importance of which becomes daily more urgent. The author is the director of water pollution research of the Department of Scientific and Industrial Research, which has published the book. It seems destined to stand for many years as the accepted text-book on the subject. The pages are replete with scientific data, which will be of great value to workers in this field, but are hardly within the grasp of the reader who has only a casual interest. From the national point of view the book is timely. The discharge of inadequately treated sewage and industrial waters may lead to very serious consequences. It can destroy fisheries and spoil natural waters for recreation or seriously impair the use of a river as a source of water supply for domestic, industrial and agricultural purposes. No comprehensive book has been published on this subject since 1913.

The first two chapters give an account of the results which may follow from the discharge of different types of industrial wastes to surface waters and the influence which these discharges may have on the use of water for various purposes. The third chapter describes the effects of polluting substances on fisheries and includes data on the toxicity of the more important constituents of industrial effluents. Dr. Southgate then gives an account of the many advances which have been made in methods of treating sewage and industrial waste in recent years, particularly by biological processes. The remaining chapters describe the methods used in purifying waste waters from particular types of industries. They treat waste waters from the mining and washing of coal and with the very polluting liquids produced at gas works and coke ovens, especially in the recovery of ammonia. Another section of the book affects the metallurgical industries and deals with the waste waters from the pickling of steel and copper, from the anodising of aluminium and from electroplating. There is a full account of modern methods of treating waste waters containing chromates and cyanides, both of which are very toxic and often have to be removed, even when the waste waters are subsequently discharged to a domestic sewer for further treatment at a sewage-disposal works. Other industries which are dealt with are textiles, laundering, leather tanning, paper manufacture, milk, slaughtering of animals and manufacture of fish meal, fermentation and canning and drying.

In each case the various methods of treatment are described and a summary of the results of treatment is given in a series of tables, from which the success of these methods can be judged. The scholarly approach of Dr. Southgate is emphasised by the list of the more important published papers on the subject at the end of each chapter.

RIVER LUNE POLLUTION

THE Town Clerk of Lancaster (Mr. R. M. Middleton), speaking at a dinner arranged by the local building federation recently, said that if the River Lune Board of Fishery Conservators was successful in obtaining an injunction against the Lancaster Corporation, restraining it from polluting the tidal waters of the river several of the most important bleaching and silk manufacturing firms in the town might have to close.

The board, for some time past, had been calling upon the corporation to tighten up existing effluent disposal arrangements, holding that the River Lune did not conform to modern public health standards. The effluent is said to come from, among other firms, Lansil, Ltd., Standfast Dyers and Printers, Ltd., and Nelsons Silks, Ltd. Mr. Middleton said that if the injunction were granted a number of the firms might not be able to carry on and some 3000 employees would be in danger of dismissal.

The Lancaster Corporation pleads that it has applied for the necessary materials, in order to improve disposal methods, but has had to "join the queue" and no special priority has been allotted. When materials are to hand work will begin at once, but if the injunction is granted first then stoppages at some of the firms involved would be unavoidable.

Home News Items

I.C.I. Dramatic Society. — The I.C.I. (Widnes) Dramatic Society recently presented, at the Recreation Club, Widnes, "The Watched Pot," a comedy by Saki (H. H. Munro).

Biochemistry Congress.—The first International Congress of Biochemistry will be held at Cambridge from August 19 to 25, 1949. The congress is being organised in 12 sections for the reading of papers and discussions. There will also be a series of lectures and visits to research stations and laboratories.

Tax-Free Accumulators.—After consultation with the Accumulator Makers' Association and the Hearing Aid Manufacturers' Association, the Commissioners of Customs and Excise have agreed, for the present, to exempt from Purchase Tax individual 2-volt accumulators of a capacity not exceeding 7 ampère hours at the 14 hour discharge rate, except those having glass containers.

Census Postponed.—Mr. Harold Wilson, President of the Board of Trade, announced last week that the compulsory census of distribution, designed to be taken in January, 1950, on this year's trading, had been postponed. The reason stated was that traders were not sufficiently well aware of the form the census would take, and did not sufficiently understand their responsibilities under the compulsory order.

Carbon Black from British Tar.—Plans are well advanced for the erection of plant in this country to produce imported types of carbon black using American processes, said the President of the Board of Trade (Mr. H. Wilson), replying to Mr. Scott Elliott in the House of Commons last week. One of the companies concerned, he added, was considering the possibility of using home-produced tar products as their raw material in due course.

Extraction Metallurgy Research. — The date for the receipt of applications for the Nuffield Foundation Research Fellowship in Extraction Metallurgy has been put forward to March 31. The Fellowship will be tenable at the Royal School of Mines, London, for up to five years, and the funds available are sufficient to provide a salary of from £1200 to £1500 per annum for the Fellow, and some £2500 per annum for assistants and apparatus. Applications should be sent to the secretary, the Institution of Mining and Metallurgy, Salisbury House, London, E.C.

Berlin Postal Service Resumed. — The parcel post service from the U.K. to civilian addresses in all sectors of Berlin and in the Soviet Zone of Germany, which was suspended at the beginning of December owing to transport difficulties in Germany, has been resumed via Poland.

Films on Welding.—The British Oxygen Co., Ltd., arranged to present yesterday (Friday) a film show on welding at the North-East Essex Technical College and School of Art, Colchester. This, a free performance for educational purposes, was to include the films "Elementary Instruction" and "Oxygen in Industry."

War Department Stocks.—The Chloride Electrical Storage Co., Ltd., states that unused Exide batteries formerly War Department stock are being offered for sale as new at much reduced prices. These batteries, says the company, must have left the works at least three years ago, and possibly as far back as 1940, and it cannot be answerable for their performance or life.

Coal Production.—The total output of coal in Britain last week showed an increase of 53,700 tons over the previous week and was 188,000 tons more than the corresponding week of last year. Comparative production figures were: Last week, 4,284,500 tons (4,088,400 tons deep-mined, 196,100 tons opencast). Previous week: 4,231,000 tons (4,056,000 tons deep-mined, 175,000 tons opencast).

£80 Motor Truck.—The "Wrigley" lightweight, petrol-driven truck has been marketed by Wessex Industries (Poole), Ltd., Dolphin Works, Poole, Dorset, to meet the need for a unit at a price (approximately £80) within the reach of the smaller operator in both the industrial and agricultural fields. The normal carrying capacity on level ground is about 5 cwt. Petrol consumption is claimed to average less than one pint per hour.

Mining and Engineering Examinations.—The annual examinations of the North of England Institute of Mining and Mechanical Engineers for certificated studentship in Mining Engineering and Mechanical Engineering (Vocational Subjects) will be held in the King's Hall, King's College, Barras Bridge, Newcastle-upon-Tyne, on April 28. There is no entrance fee and no age limit, and the examinations are open to all suitable applicants, whether members of the institute or not.

Next Week's Events

MONDAY, JANUARY 31

Institution of Rubber Industry. Leicester: College of Technology, 7 p.m. Dr. C. M. Blow: "Latex."

Sir John Cass Technical Institute. London: Department of Chemistry, Jewry Street, Aldgate, E.C.3, 6.30 p.m. N. W. Roberts: "Thermodynamics for Chemical Engineers" (No. 3).

TUESDAY, FEBRUARY 1

Hull Chemical and Engineering Society. Hull: Church Institute, Albion Street, 7.30 p.m. Joint meeting with Hull Guild of Building. H. V. J. Harris: "Scientific Progress and the Public Telephone Service."

Sir John Cass Technical Institute. London: Department of Chemistry, Jewry Street, Aldgate, 6 p.m. First of six lectures. Prof. H. S. W. Massey: "Atomic Nuclei."

WEDNESDAY, FEBRUARY 2

Royal Institute of Chemistry. Birmingham: University, Edmund Street, 6.30 p.m. Dr. Joseph Needham: "Science and UNESCO."

Society of Chemical Industry (Food Group). Portsmouth: Municipal College, 7 p.m. Joint meeting with Royal Institute of Chemistry and the Chemical Society. Dr. L. H. Lampitt: "Food Science in Evolution."

Manchester Metallurgical Society. Manchester: Engineers' Club, Albert Square, 6.30 p.m. Joint meeting with the Iron and Steel Institute. J. Glen: "Precipitation—Hardening Effects in Relation to High Temperature Testing."

Institute of Welding. Manchester: College of Technology, 7 p.m. D. W. Low: "Where Welding Wins."

Society of Public Analysts and Other Analytical Chemists. London: Manson House, Portland Place, W.1, 7 p.m. H. N. Wilson: "A Rapid and Accurate Volumetric Method for Determination of Silica"; M. Clasper and J. Haslam: "The Analysis of Nylon and Related Polymers"; W. C. Coppins: "The Quantitative Separation of Beryllium and Aluminium."

THURSDAY, FEBRUARY 3

The Chemical Society. London: Burlington House, W.1, 7.15 p.m. Johannes Nicholas Bronsted Memorial Lecture, R. P. Bell.

Textile Institute (Blackburn Branch). Blackburn: Demonstration Theatre, Electricity Showrooms, 7.15 p.m. W. Sturzaker: "Dyeing and Sizing of Cotton Yarns."

Leeds Metallurgical Society. Leeds: University, 7 p.m. R. W. Bailey: "The Function of Ductility in Design."

Royal Institute of Chemistry (Liverpool and North Western Area). Liverpool: University, 7 p.m. Dr. H. H. Hodgson: "Some Recent Studies in Diazo-Chemistry."

Sir John Cass Technical Institute. London: Department of Chemistry, Jewry Street, Aldgate, E.C.3, 6 p.m. David W. Wilson: "Microchemical Analysis" (No. 3).

The Royal Society. London: Burlington House, W.1, 4.30 p.m. R. Brown, A. W. Johnson, E. Robinson and A. R. Todd: "The Stimulant Involved in the Germination of *Striga hormonthica*"; E. G. Pringsheim: "The Filamentous Bacteria *Sphaerotilus, Leptothrix, Cladothrix*, and their Relation to Iron and Manganese."

FRIDAY, FEBRUARY 4

Royal Institute of Chemistry. Wolverhampton: Technical College, 6.30 p.m. Mr. Chamberlin: "Colour."

Institution of Chemical Engineers. Manchester: Town Hall, 2.15 p.m. Annual general meeting. F. A. Freeth: "The Place of Heterogeneous Equilibrium in Chemical Engineering."

Society of Dyers and Colourists. Bury: Technical College, 7 p.m. G. S. Marr: "Warp Dyeing."

Sir John Cass Technical Institute. London: Department of Chemistry, Jewry Street, Aldgate, E.C.3, 6.30 p.m. "Unit Operations in Chemical Engineering—No. 2," D. A. Johnson: "Drying."

SATURDAY, FEBRUARY 5

Textile Institute (Burnley Branch). Manchester: Visit to British Cotton Industry Research Association, Shirley Institute, Didsbury.

Royal Institute of Chemistry (London and South-Eastern Counties Section). Brighton: Technical College, 6 p.m. Prof. C. Tyler: "The Biochemistry Involved in Eggshell Formation."

Exhibition Again Postponed

The Engineering, Equipment and Materials Exhibition, originally announced for October last year, was postponed to take place from January 26 until February 9 this year. The organisers have now stated that the exhibition has once again been put off, and will now be held concurrently with the Building and Engineering Exhibition from May 16-27.

Overseas News Items

New German Cement Plant.—The Allied authorities have agreed to the proposed erection near Heidelberg, of a new cement plant with an annual capacity of 60,000 tons.

U.S. Copper Refinery.—The Kennecott Copper Corporation will spend $16 million in building the States' first electrolytic copper refinery at Garfield, Utah, which will employ 5300 workers and will be finished in March, 1950.

Penicillin Rationed.—The French influenza epidemic is stated to have greatly depleted stocks of penicillin. Demand has been four times as high as for comparable periods in normal years. As a security measure, pharmacists have instituted a rationing system.

German Penicillin.—It is reported that the Hoechst works of the former I.G. Farbenindustrie is to make penicillin on a large scale shortly. So far, production has covered only about 10 per cent of demand. The monthly output of the works is estimated at 100,000 million units.

Norwegian Nickel Industry.—The Falconbridge Nickel Works, Kristiansand, Norway, is to be expanded and modernised. In particular, the installation of a new smelter is expected to increase output of electro-nickel by 50 per cent, to 14,000 metric tons per annum. The construction of a new unit for the refining of nickel sulphate and the production of cobalt is also planned.

Pectin Industry for South Africa?—A proposal to establish a pectin manufacturing industry in South Africa has been put forward by M. E. K. Moessmer, a Rand engineer. Supplies are at present all imported from America. It is claimed that machinery and technicians could be imported from Britain and Germany and that, after home demands have been met, there is an assured export market.

South African Insecticides.—What are described as the heaviest demands ever experienced for agricultural and general DDT and BHC insecticides are being met by South Africa's national factory at Klipfontein. It has recently sent 50 tons of benzene tetrachloride bait powder and 20 tons of BHC wettable powder for spraying to the locust areas in the Karroo. The "hopper" swarms are sprayed too with a water suspension of the 40 per cent wettable powder; the same spray is used for the adult stage. Large supplies of DDT are also being sent to Northern Zululand, with DDT dipping emulsion, for combatting tetse fly.

Czechoslovak Coal Output.—Czechoslovakia's coal output (in 1000 tons) last year reached the record figure of 17,745 for hard coal, and of 23,590 for brown coal. The comparative figures for 1947 were respectively: 16,216 and 22,363.

Oil Refinery for Madras.—Preliminary investigations are reported to have been inaugurated by U.S. oil interests regarding the erection of an oil refinery with an annual charging capacity of 2 million tons in the Province of Madras, India.

Geigy Works Seeks New Finance.—An extraordinary general meeting has decided to increase the share capital from four to 10 million Swiss francs by a new share issue. The last increase took place in 1943, when capital was doubled from two to four million francs.

Europe's Aluminium Needs.—Mr. Howard Bruce, deputy administrator of ECA, announced in Washington last week that a mission would be sent to Europe to determine the "irreducible needs" of Marshall Plan countries for aluminium and lead, states a Reuter message.

Sulphur Production in U.S.A.—Production of native sulphur in the U.S.A. during October, 1948, was 393,385 long tons, which represented a slight decrease on the previous month. Total output for the 10 months ending October was 4.018 million long tons, compared with 3.647 million long tons in the corresponding period of 1947.

100,000 Francs for Safe Insecticide.—The National French Apiculture Union has founded a 100,000 franc prize, to be awarded in 1949, for the protection of bees against insecticides. The prize is for a repelling agent which can be added to insecticides now used, or the production of new insecticides suitable for agriculture and not toxic to bees.

Italian Chemical Requirements.—Private advices received from Italy indicate a continuous demand for the following chemicals: Amyl alcohol, butyl alcohol, lauryl alcohol, fatty alcohols, butyl phthalate, amyl acetate, salicylic and oxalic acids, glycerine (doubly distilled), tricresylphosphate, crude benzol, toluol, xylol, cresol, solvent naphtha, fatty acids, oleine, stearine, phenol (crystallised at 39-41°), potassium hydroxide (88-92 per cent), potassium carbonate, nitrate, sulphate and cyanide, magnesium sulphate, crude coal tar (preferably from gas works), naphthenate, trinatriumphosphate, naphthaline, and synthetic waxes.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsibe for errors that may occur.

Satisfactions

ADVANCED CHEMICAL INDUSTRIES, LTD., Liverpool. (M.S., 29/1/49.) Satisfaction December 17, of mortgage registered June 21, 1947.

TREDEGAR IRON & COAL CO., LTD. (M.S., 29/1/49.) Satisfaction December 15, of Trust Deed registered December 22, 1937.

Receivership Void

DESPIL CHEMICAL CO., LTD.—A letter on the file of the Despil Chemical Co., Ltd., dated January 4, 1949, states that the appointment of Mr. S. Whitehead, C.A., is void and has not been proceeded with, as the sanction of the court for such appointment was not obtained.

Company News

The address of **Potash, Ltd.,** has been changed from 112 Fenchurch Street, E.C.3, to Carlton House, 11d Regent Street, S.W.1.

The directors of **Redfern's Rubber Works, Ltd.,** have recommended that a dividend of 5 per cent on the ordinary shares making 10 per cent for the year, plus a bonus of 7½ per cent, be paid on March 15 in respect of the year 1948. These are the same rates as last year. Net profit was £47,757 (£41,219).

The following increases in registered capital are announced: **George Williams & Co. (London), Ltd.,** from £500 to £2500; **H. J. Elliott, Ltd.,** from £25,000 to £26,175; **Cornbrook Chemical Co., Ltd.,** from £30,000 to £60,000.

New Companies Registered

Brotherton & Co., Ltd. (463,653). Public company. Capital £1,275,000. Objects: To acquire the undertaking and assets of and assume the liabilities of Brotherton & Co., Ltd. (incorporated in 1902), except that part contained in the scheme of arrangement and reconstruction dated October 13, 1948, which is to be transferred to the new investment company referred to there; and to carry on the business of manufacturers and distillers of ammonia and tar, manufacturers, carbonisers, distillers or manipulators of coke, coal, oxides, ammoniacal liquor, mineral and chemical substances, etc. Directors: B. L. Ratcliffe, G. Brotherton-Ratcliffe, G. Brearley, L. Weaver, E. D. Whitelock, and G. J. Denbigh. Solrs.: Simpson Curtis & Co., Leeds, 1. Reg. office: City Chambers, Infirmary Street, Leeds.

Downswood Products, Ltd. (463,225). Private company. Capital £200. Manufacturers of chemicals, plant and fittings for chemical and clinical laboratories, etc. Directors: R. J. Felstead, D. R. W. Felstead. Reg. office: 44 Woodberry Avenue, Winchmore Hill, N.21.

East Anglia Lacquer Co., Ltd. (463,453). Private company. Capital £5000. Manufacturers of and dealers in lacquers, rubber and insulating materials, electrical cables, paints, varnishes, plastic paints, white lead, etc. Solrs.: Theodore Goddard & Co., 5 New Court, W.C.2.

Formoy (Olive Oil), Ltd. (463,229). Private company. Capital £100. Manufacturers and refiners of olive oil, etc. Directors: W. P. Formoy and C. L. Greatorex. Reg. office: Regent House, 89 Kingsway, W.C.2.

Irish Oxygen Co., Ltd. (12,731). Private company. Capital £60,000. Manufacturers of carbonic acid, oxygen, etc. Directors: W. Pope, J. Constant, L. Constant and A. E. Pope.

Kirkham Investment Trust, Ltd. (463,670). Public company. Capital £1,475,000. Objects: To acquire that portion of the undertaking, property, assets and liabilities of Brotherton & Company, Ltd. (incorporated in 1902), which is to be transferred under a scheme of arrangement and reconstruction dated October 13, 1948; and to carry on the business of an investment and trust company, etc. Directors: B. L. Ratcliffe, G. Brotherton-Ratcliffe, J. T. Barrie and T. B. Simpson. Reg. office: City Chambers, Infirmary Street, Leeds.

J. Lee Jones, Ltd. (462,423).—Private company. Capital £300. Manufacturing and advising chemists, etc. Directors: M. Lee Jones and N. F. Jones, both of 96 Albany Road, Roath, Cardiff.

Moore & Barrett, Ltd. (463,506). Private company. Capital £3000. Objects: To acquire the business of analytical chemists and petroleum technologists now carried on by Moore & Barrett at 144 Bramhall Lane, Stockport. Directors: P. H. Moore and J. Barrett. Reg. office: 144 Bramhall Lane, Davenport, Stockport.

Mountfair Produce, Ltd. (462,502). Private company. Capital £5000. Manufacturers of oils, resins, colours, ebonite, plastic materials, etc. Director: H. J. Kendrick. Reg. office: 39-41 New Bond Street, E.C.2.

Chemical and Allied Stocks and Shares

LITTLE variation has been evident in stock markets in the course of the week, international uncertainties and Sir Stafford Cripps's expectation that dividend limitation will remain for another year being factors making for caution. British Funds were relatively firm, but industrials recorded small irregular movements, and buying was very selective.

Chemical shares moved narrowly with the general trend. Imperial Chemical were 48s. 7½d. at which the yield is not far short of 4½ per cent on the 10 per cent dividend, which is generally expected to be maintained for the year. Laporte 5s. units were 21s. 3d. and Amber Chemical 2s. shares 9s. 7½d. Albright & Wilson were 31s. 3d. and Bowman Chemical 7s. 3d. Fisons were again around 59s., Burt Boulton 28s. 9d. and Turner & Newall changed hands around 84s. 6d. British Glues & Chemicals 4s. ordinary strengthened afresh to 22s. 6d. and Coalite & Chemical 2s. shares were 3s. 10½d.

Glaxo Laboratories holdings have been dealt in around £22½, but British Xylonite eased further to £5 15/16. The 4s. units of the Distillers Co. were 29s. 3d., United Molasses 51s. 3d. and British Plaster Board eased to 24s. 9d. Cement shares, helped by latest production figures, were prominent, Associated Cement being marked at 82s. 9d., Tunnel Cement 51s. and British Portland 86s. 3d. Elsewhere, General Refractories 10s. shares have been firm at 23s. 3d. following news of increasing demand for refractories. De La Rue at 40s. 3d. held their recent improvement, British Industrial Plastics 2s. shares were again 7s. 1½d. and Borax Consolidated deferred showed firmness at 63s. 6d.

Monsanto Chemicals 5s. ordinary were again 62s. 6d., British Aluminium 51s. and British Oxygen 51s. 10½d. Triplex Glass remained steady at 23s. 9d. Amalgamated Metal eased slightly, changing hands around 20s. 6d., and British Drug Houses 5s. ordinary kept at 8s. 9d.

Iron and steels again showed only small irregular movements, and shares of companies threatened with nationalisation failed to attract attention despite the good yields in many cases and the fact that at the earliest, nationalisation cannot be carried out before May 1, 1950. Among other heavy industries, Babcock & Wilcox held their rise to 74s. 6d., while T. W. Ward moved up to 67s. 3d. Powell Duffryn (29s. 3d.) were again firm. Elsewhere, Goodlass Wall 10s. ordinary remained at 39s. Lever & Unilever eased to 49s. 6d. and, on Dutch reports of a coming capital increase, Lever N.V. receded to 46s. 3d. Staveley remained around 89s. 4½d. Electrical equipments have been attracting rather more attention on current reports of further growth in export business. Associated Electrical were 80s., General Electric 91s. 9d. and English Electric 49s.

Boots Drug 5s. ordinary were firm at 56s. 9d., the yield of 3½ per cent continuing to testify to the investment standing of the shares, based on the strong balance sheet and expectations of an increased distribution for shareholders when dividend limitation and the Bonus Tax are lifted. There are also suggestions in the market that, if expansion of business arising from the National Health scheme requires more capital, this is likely to be raised by an offer of shares on favourable terms to shareholders.

Beechams deferred units changed hands around 17s. 10½., still yielding over 5½ per cent, assuming the total for the year is again brought up to 40 per cent. Sangers 5s. shares were 34s. 6d. Oils have been steadier, Anglo-Iranian at £9 1/16, Shell 75s. and Burmah Oil 70s., sentiment having been influenced by hopes of peace in Palestine, and reports of American plans for helping countries in the Middle East.

REFINERY'S WATER NEEDS

AT the resumed Ministry of Health inquiry at Chester, on January 18 and 19, into the application of the Shell Refining and Marketing Co., to construct 12 water bore-holes on their 400-acres estate at Thornton-le-Moors (THE CHEMICAL AGE, *60*, 134), in connection with their new oil refinery there, strong opposition to the scheme was forthcoming from the West Cheshire Water Board, the Cheshire County Council, the Runcorn Rural Council, and the Chester Rural Council.

Mr. G. B. Finlow, Cheshire County Council, supporting the proposal for alternative supplies from waterways, said the Shell Company proposed to take millions of gallons of water a day from an area of about three square miles.

On the second day of the inquiry, Mr. D. J. Pull, engineer in charge of construction, said when the whole area was developed the number of regular employees would be not far short of 10,000. This would not include constructional labour of from 1500 to 2500. In addition to spending £200,000 on wells the company would spend another £220,000 on a canal scheme for cooling water.

Prices of British Chemical Products

SUSTAINED activity has been reported from most sections of the industrial chemical market during the past week. The movement into consumption has not been confined to any one industry and delivery specifications for the paint, plastics, rubber and textile industries have, in the main, been up to the full extent of contract commitments. With regard to exports the volume of inquiry is well maintained and there have been no signs of any curtailment in demand. Prices generally are firm at recent rates the only alteration of note being an advance of £5 per ton in the price of titanium oxide. In the coal-tar products market active conditions continue, home requirements being met more freely.

MANCHESTER.—Price conditions on the Manchester chemical market during the past week have been steady to firm in almost all sections. The textile and other principal using industries are calling for good deliveries of the soda compounds and a wide range of other heavy chemicals under contracts. New business on home consumption account as well as for export has been fairly extensive. Among the fertilisers, there is a continued brisk demand for basic slag and growing interest is being shown in superphosphates, sulphate of ammonia and other products. In the market for tar products, a steady trade is being done in pitch, crude tar, carbolic acid and most of the light distillates.

GLASGOW.—Conditions have at length returned to normal in the Scottish chemical market, and a satisfactory volume of business has been transacted during the past week. The supply position in general has been easing, and at the present time there are no outstanding shortages. Deliveries of most materials are good. The importance of the production of Scottish-produced chemicals is steadily increasing, and recently another factory has gone into production, producing formaldehyde. A quantity of material has been shipped during the past week and a few orders have been received.

Price Changes

Rises: Alum, lead carbonate, lead nitrate, red lead, white lead, litharge, titanium oxide.

Reductions: Cream of tartar, compound fertilisers—I.C.I. No. 1 grade.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £64; 80% pure, 1 ton, £66; commercial glacial 1 ton £79; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetic Anhydride.—Ton lots, d/d, 11¾d. per lb.

Acetone.—Maximum prices per ton, 1/5 tons, £76 10s.; single drums, £77 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 7½d. per proof gallon; 5000 gal. lots, d/d, 2s. 10½d. per proof gal.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: £17.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate. — MANCHESTER: £48 per ton d/d.

Ammonium Carbonate.—£48 per ton d/d in 5-cwt. casks. MANCHESTER: Powder, £50 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Antimony Oxide.—£162 10s. per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 10s. per ton in casks.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£29 per ton, d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 7s. 7d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 7½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 10½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 8½d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., from 152s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £115 per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g., 123/1 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 130s. to 135s. per cwt. Tonnage deliveries: 125s. to 130s. per cwt.

Lead Carbonate.—British dry, ton lots, d/d. £146 per ton.

Lead Nitrate.—About £135 per ton d/d in casks. MANCHESTER: £125.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £137 10s.; orange lead, £149 10s. Ground in oil: red, £159 10s., orange, £171 10s. Ready-mixed lead paint: red, £163, orange, £175 (subject to increase of £1 10s. per ton).

Lead, White.—Dry English, in 8-cwt. casks, £146 per ton. Ground in oil, English, in 5-cwt casks, £167 per ton.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£137 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt. lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 10d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 11d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9½d. per lb.; ground, 10½d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s. 1d. per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£60-£75 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £19 15s. per ton.

Sodium Nitrite.—£28-29 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 5s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £23 per ton, d/d, in drums; broken, £23 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 to £7 per ton; 140° Tw., arsenic free £4 5s to £5 5s. per ton; 140° Tw., arsenious, £4 15s. per ton. Quotations naked at sellers' works.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags), £102 per ton.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £101 15s.; green seal, £100 15.; red seal, £99 5s.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached £8 3s. 6d. per ton

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

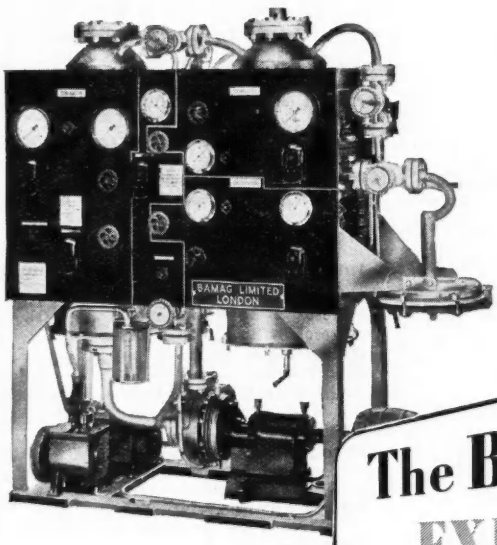
Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5½d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £33 12s. 6d. per ton.



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Mineral Black.—£7 10s. to £10 per ton.
Mineral Rubber, "Rupron."—£20 per ton.
Sulphur Chloride.—7d. per lb.
Vegetable Lamp Black.—£49 per ton.
Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Not quoted—temporarily unobtainable.
Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January, £10 5s., rising by 1s. 6d. per ton per month to March, 1949.
Calcium Cyanamide.—Nominal; supplies very scanty.
Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d.
"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.
Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.
Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 3s. 6d. to 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d; crude, 4s. 3d., naked, at works.
Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d. to 9¾d. per gal.
Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.
Naphtha.—Solvent, 90/160°, 2s. 11d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.
Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.
Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £8 5s. to £9 5s. per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.
Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 17s. 6d. to 21s. per gal.
Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.
Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.
Methyl Acetone.—40/50%, £56 to £60 per ton.
Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.
Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.
Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.
o-**Cresol** 30/31° C.—Nominal.
p-**Cresol** 34/35° C.—Nominal.
Dichloraniline.—2s. 8½d. per lb.
Dinitrobenzene.—8½d. per lb.
Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.
p-**Nitraniline.**—2s. 5d. per lb.
Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.
Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.
o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.
p-**Toluidine.**—2s. 2d. per lb., in casks.
m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—January 26.—The prices of LINSEED, RAPESEED, COCONUT, PALM KERNEL, GROUNDNUT and WHALE OILS, as well as ACID OILS, are unchanged (THE CHEMICAL AGE, October 30, 1948). These prices continue for periods ending February 5 in respect of crude oils, and January 29 for refined oils. ROSIN and TURPENTINE prices remain the same, according to grade.

KEEBUSH

Keebush is an acid-resisting constructional material used for the construction of tanks, pumps, pipes, valves, fans, etc. It is completely inert to most commercial acids; is unaffected by temperatures up to 130°C; possesses a relatively high mechanical strength, and is unaffected by thermal shock. It is being used in most industries where acids are also being used. Write for particulars to—

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We have long been studying the anti-corrosive properties of rubber. As a result of extensive research we can offer effective and economical solutions to many of the problems arising in the Chemical, Leather, Textile, Laundry and other industries where machinery and installations want protection from the corroding influences of Acids, Alkalis, Salts and Bleaches.

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Subject to temperatures and concentrations specified by our Technical Department, Dunlop Anti-Corrosion Rubber provides satisfactory protection against these chemicals:

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Sulphuric Acid
Sulphurous Acid
Tannic Acid
Tanning extracts
Vinegar

Ammonia
Ammonium Hydroxide
Ammonium Carbonate

Calcium Hydroxide
Caustic Potash
Caustic Soda
Milk of Lime
Potassium Carbonate
Sodium Bicarbonate
Sodium Carbonate

Bleach Liquor
Chlorine Gas (Dry)
Sodium Hypochlorite
Hydrogen Peroxide

Ammonium Sulphate
Copper Sulphate
Sea Water
Sodium Sulphate
Zinc Chloride (up to 50%)
Zinc Sulphate

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

AN expanding Middle East Oil Company urgently requires an Assistant Engineer to work initially in the London Office and be willing to accept transfer to the Persian Gulf after one year. Should possess B.Sc. Degee in Chemical or Mechanical Engineering. Will be required to assist in duties involving loading and bunkering facilities, oil gas distribution, and other oil control duties. Some experience of these duties essential. Experience in oil bunkers control with docks operating group of the Royal Engineers may be advantageous. Age 25–30. Salary starting £600-£700 per annum according to age and experience. Write, giving brief details, for application form, and quoting LO 133, to Box "P.Y." c/o J. W. VICKERS & Co., LTD., 7/8, Great Winchester Street, London, E.C.2.

CHEMICAL Engineers required in the London area for development and technical design work. Applicants should be Graduates in Chemical Engineering or Graduates in Chemistry, with chemical engineering experience. Age, between 28 and 40. These posts are progressive and pensionable, and starting salaries will lie between £700 and £1,000. Apply, Box No. 2763, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SENIOR Draughtsman required for chemical works. Applicant should be 30 to 40 years of age, having a high standard of drawing skill and experience of chemical works, and be capable of collaboration with technical staff for the design and layout of new chemical plants. Applicants should state age, full details of training and experience, and salary required, to WORKS MANAGER, John Nicholson & Sons, Ltd., Hunslet Chemical Works, Leeds, 10. (By permission of the Ministry of Labour and National Service, under the Control of Engagement Orders, 1947 and 1948.)

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PLANT. 16 in. 3-roll Cream Mill by Worssam, new. 4 Peerless Mixing Machines. Alite Powder Filler with cream attachment. Powder Mill and Mixer by Pascall. Albro Bottle Fillers, single and twin; 3 Lipstick Moulds, 36/72 hole; 3 Base Melters; 2 Centron Jar and Tube Fillers; Colton ditto; Tube-closing and Crimping Machines; 2 Wax Mixers; Stainless Steel Storage Containers; Water-jacketed Pans; Doulton Crocks; Prestcold Refrigerator; Perfio Powder Mixer; Turbine Sifter; Conveyor Belt; Time Recorder; 2 Platform Scales; Airspray; **Baker Microscope,** 3 B.Q.; 3 Bench Scales and Balances; Electric Oven; Laboratory Utensils.

Office and Factory Furniture and Fittings. Desks; Tables; Safes; 9 Typewriters; Art Metal Shelving; Timber Packing Tables and Work Benches; Storage Racks; Stools; Ascot Heaters.

Stock of Chemicals, Raw Materials and Perfumes. 15 cwt. Glycerine; 59 gal. Witch Hazel; 67 cwt. White Oil; 6 cwt. Castor Oil; 5 tons Wax, various, including cetyl alcohol, Beeswax, etc.; Spermacotti and Steric Acid; 52 lb. Violets; 9 cwt. Lanolin; 22 cwt. White Pet Jelly; 12 cwt. Titanium Dioxide; various Colours and Dyes by S. G. Walker, Williams & Drake Law. 1,100 gross ½/1/2/4 oz. jars Cream and Ointment; 1/4/8 oz Bottles, various; Adhesive Tape; Filter Silk, etc.

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ACCURATE Powders for Ceramic, Alloy, Plastic, Paint, etc., industries. DOHM LTD., Pulverisers, 167, Victoria Street, London, S.W.1.

BELT Driven Elevator, steel cased, 2 ft. by 1 ft. by 16 ft. long, 14 ft. centres, 6 in. belt steel buckets, 5 in. by 4 in. by 3½ in. by 12 in. centres, feed hopper, fast pulley. Price £75. THOMPSON & SON (MILLWALL) LTD., Cuba Street, London, E.14. East 1844.

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Drum cell type. 4 ft. 7½ in. diameter × 2 ft. 7½ in. wide. Filter surface 35 sq. ft. 2 h.p. 4-speed motor with starter. Makers, International Combustion Co, Ltd. Brand new condition £1,350

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COMPLETE **CALCINING PLANT** by Edgar Allen. 6 in. brick lined rotary kiln, 51 ft. long by 7 ft. diam., constructed ¼ in. plate driven by 25 h.p. motor. Rotary cooler, 35 ft. long by 4 ft. diam., constructed ⅜ in. plate driven by 7½ h.p. motor.

Two British Rema **SWING HAMMER PULVERISERS** or **HIGH OUTPUT DISINTEGRATORS,** 32 in. diam. by 6 in. wide beater chamber driven by 35 h.p. motor. Complete with approx. 155 ft. centres 16 in. wide troughed rubber belt conveyor etc.

Size 7 Duplex **MIXING AND KNEADING MACHINE** by Morton, steam jacketed, trough size approx., 42 in. by 38 in. by 30 in. Working capacity 115 gallons. Fitted twin gunmetal mixing blades double Naben type. Suitable for int. working pressure of 15 lb. p.s.i. or high vacuum. Forward and reversing pulleys.

Direct electrically driven **HYDRO EXTRACTOR** of pitless type by Broadbent. 42 in. diam. by 16 in. deep galvanised perforated basket.

Unused Mitchell Shanks centrifugal **ACID PUMP,** vitreon lined, size and type MS.5/160, 2½ in. diam. suction, 2 in. diam. delivery. Delivery head 33 ft./26 ft.

Vertical cylindrical open top steam jacketed **MIXER,** approx. 6 ft. diam. by 5 ft. deep, constructed ¼ in. mild steel plate riveted and welded. Jacketed working pressure 50 lb. p.s.i. Vertical overdriven paddle agitator. Driven by 5 h.p. motor, 400/3/50.

Sturtevant Sun and Planet type **MIXER,** 3 ft. diam. by 18 in. deep. Paddle type agitator driven through gearing. Feed opening approx. 12 in. by 12 in. Bottom discharge approx. 9 in. by 6 in.

Vacuum **EVAPORATING PLANT** by Morton, comprising tinned copper pan approx. 8 ft. overall depth by 5 ft int. diam. steam jacketed. Evaporator capacity 300 gallons per hour.

Unused Mitchell Shanks centrifugal **ACID PUMP,** vitreon lined. Size and type MS. 7/200 3in. diam. suction, 2½ in. diam. delivery. Delivery head 46 ft./30 ft.

No. 82 model locker rotex twin deck **VIBRATING SCREENS,** approx. 11 ft. by 4 ft, complete with 3 h.p. 420/3/50 motor. Two available.

Unjacketed horizontal trough **MIXER** by Young, approx. 6 ft. by 2 ft. by 2 ft. Scroll type agitator fast and loose pulley driven.

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FOUR—4-pot stainless steel Ball Mills with two containers, 1 ft. 2in. diam. by 1 ft. 3 in. deep and two 9 in. diam. by 10 in. deep. Units driven through vee ropes from new enclosed drip proof starters, 400/3/50 cycles supply.

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SIX—3 in. Regulus metal acid Valves, straight through pattern, standard flanges, stainless steel fittings.

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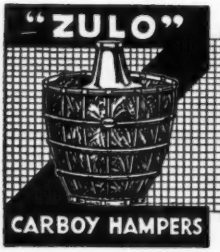
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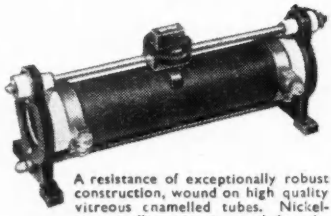

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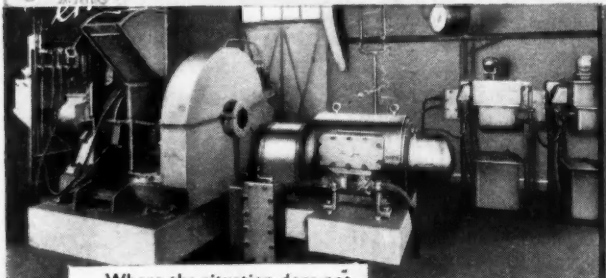

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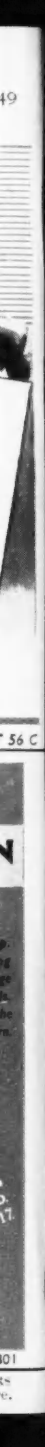
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